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Conservation of Angiosperm Diversity:
Hidden Treasure of Today and Tomorrow

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ABSTRACTS

EDITORIAL TEAM

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Prof. R. S. Rao Award

RSR-1: Diversity, endemism and conservation of the genus *Ophiorrhiza* L. (Rubiaceae) in Western Ghats

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Ophiorrhiza, a notably species-rich genus of Rubiaceae consists of 319 species and 8 subspecies or varieties. Most representatives are occurring widely in tropical and subtropical Asia, only a few scattering to Australia, New Guinea and the Pacific islands. As part of the taxonomic studies of the genus in Western Ghats, the authors came across several accessions of different *Ophiorrhiza* taxa from various parts of Western Ghats. The study concluded that, a total of 25 taxa were distributed in Western Ghats with major diversity in southern Western Ghats, especially Kerala region. During present study, resulted in the discovery of two new species viz. *O. jacobii* and *O. sahyadriensis*, rediscovery of *O. radicans* and *O. pykarensis*, newly records of *O. rugosa* var. *angustifolia* for the flora of India and *O. heterostyla* for South India. Among the 25 taxa, more than 80% are endemic to Western Ghats. IUCN status of all taxa have been prepared based field obeservations. All the collected taxa were conserved in the *Ophiorrhiza* germplasm of Calicut University Botanical Garden for further works.

RSR-2: Ex-situ conservation and reintroduction of critically endangered and endemic plant species *Commiphora stocksiana* Engl.

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Genus *Commiphora* belong to the family Burseraceae and comprises about 200 species. The genus distributed throughout dry tropical forests in both neo and paleo tropics. The genus is well known for its highly medicinally important aromatic oleo-resin which has been used by antiquity and in traditional medicinal practices. In India, a total of seven species belonging to *Commiphora* genus reported including *C. stocksiana*. The *C. stocksiana* is a critically endangered and endemic plant species reported from Kachchh region in India and Sind province of Pakistan which facing the threats of overexploitation and habitat loss. In India, very few individuals have been reported i.e. less than 10 in wild hence it's an immediate need to augment its

population to protect this endemic species from extinction. To address this issue, ex-situ conservation has been under taken in three different locations within Kachchh district. A mother plant has been identified in 2008 and protected for seed. The protected mother plant started giving viable seeds from 2014, hence a nursery has been established and from the subsequent year, sapling preparation has been started and till date around 670 seeds were planted and more than 1000 saplings were prepared. Here it is important to note that a mature viable seed can produce one to four saplings. Out of the total prepared saplings around 500 were successfully transplanted in natural areas of Kachchh district and 80% survival were observed. The nursery technique for the raising the sapling of this endemic species has been standardized and based on that further work is in progress. Within 2-3 years the first year sapling will start producing mature seeds which will be used further to restorethis species.

RSR-3: Restoration of mangroves at two 'Aila' affected parts of Sundarbans biosphere reserve through community participation

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Mangroves are salt-tolerant trees or large shrubs growing in intertidal zones in tropical and subtropical regions which support rich biodiversity and high levels of productivity. Mangroves not only provide timber and non-timber products, but also serve as coastal protection against wave and current abrasion, shelter and habitat for wildlife, and a suitable site for ecotourism. Sundarbans, the world's largest coastal mangrove forest is one of the natural wonders of the world. It was marked as UNESCO world heritage site in 1987. Sundarbans provides sustainable livelihoods to millions of people living in small villages surrounding the Sundarbans biosphere reserve practising agriculture, fishing, honey gathering and many other activities for their livelihood. The Indian part is estimated to be about 4110 km 2 , out of which 1700 km 2 area is covered by water bodies in the form of rivers, canals and creeks of width ranging from few metres to several kilometres. The stretch of mangrove forests surrounding the biosphere reserve act as a biological shield to protect the people inhabiting there from massive storms, cyclones, tidal rise, sea water inundation

etc.However, the mangrove vegetation of Sundarbans as well as other parts of the world are highly affected due to anthropogenic activities, natural calamities, climate change etc. Cyclone 'Aila', in 2009, caused extensive damage to livelihoods and mangrove vegetation in the Sundarbans and several areas of South 24 Parganas, West Bengal were severely affected.

The 'Nature Environment and Wildlife Society (NEWS)', a conservation based NGO is engaged in restoration of mangroves of 'Buraburir Tot' (G Plot, Block - Patharpratima, South 24 Parganas, West Bengal) and 'Lakshmipur' (Block - Kakdwip, South 24 Parganas, West Bengal) intertidal mangrove habitats through community participation since 2017 and the restoration process is monitored by Botanical Survey of India with objectives to stabilize the mangrove ecosystems effectively and to improve the living conditions of the local coastal population. In 'Buraburir Tot', c. 140000 seeds of Avicennia alba Blume have been planted by NEWS where the women group ('Srijoni Mohila Badabon Committee') is involved in plantation process. In 'Lakshmipur', 9310 saplings and 2028 seeds of *Rhizophora apiculate* Blume and 2415 saplings of *Sonneratia apetala* Buch.-Ham. were planted by the women group of Lakshmipur under the coordination and supervision of experts from NEWS. Further, 8000 seeds of *Bruguiera gymnorhiza* (L.) Lam. were germinated and the saplings were raised at the nursery developed by the women group of Lakshmipur which is planned to be transplanted to the intertidal mangrove habitat of Lakshmipur by October, 2018. NEWS also supports the local communities of these area to improve livelihood and income augmentation through backyard poultry farming. Afforestation, together with creating awareness among the local community and simultaneously providing the people with support and facilities for alternative income generation only can possibly be a best approach for the conservation of mangroves in the Sundarbans.

RSR-4: Conservation strategy and species reintroduction of two endemic and threatened Palm of Nicobar Island

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The paper deals with population studies and conservation of two palms *Bentinckia nicobarica* (Kurz) Becc. and*Rhopaloblaste augusta* (Kurz) Moore endemic to

Nicobar Islands, India under DBT sponsored project on preventing extinction and improving conservation status of threatened plants during 2013-2017. These islands lie between 6°40' and 13° 45' of N latitudes and 92°15 and 94°10' E longitudes. Warm and humid tropical climate with temperature from 22 0 C to 30 0 C, average annual rainfall ranging from 3000 to 3500 mm and the mean relative humidity between 80 to 90% prevails in these islands. For population study the entire area of the Nicobar Islands was divided into 800 m x 800 m grids. Belt transects of 500 m × 5 m were laid in each grid for individuals count. Based on our field data *B. nicobarica* and *R. augusta* are re-assessed as Critically Endangered (CR) according to IUCN (version 13, 2017) Red List threatened Categories and Criteria. These endemic palms are experiencing major threats in terms of habitat destruction and over exploitation for various uses. The conservation of these endemic palm species in Nicobar Islands was felt an immediate need to improve their population status. Thousands of seedlings were raised in controlled condition in Experimental Garden, Botanical Survey of India, Andaman Islands and the potential areas of the species were marked by Ecological Niche Modelling map using the modeling algorithms of DIVA-GIS and MAXENT with nineteen bioclimatic variables. Finally, the seedlings were reintroduced, and monitored with help of forest officials for successful recovery.

RSR-5: Contrasting leaf trait strategies of dominant trees and lianas in a tropical dry evergreen forest of India

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The present study was carried out in a permanent plot established in a tropical dry evergreen forest site on the Coromandel Coast of India to analyze and compare the leaf functional strategies of co-occurring dominant tree and liana life-forms. A total of twenty dominant species of lianas and trees (ten each) were selected. For each species 30 healthy sun leaves were collected from at least eight individuals. The collected leaf samples were analyzed for various leaf functional traits using standard protocol. Leaf area was analyzed using ImageJ software. Leaf thickness was measured using digital screw-gauze. Lianas had significantly higher specific leaf area and mass-based leaf nitrogen than the trees. Trees had higher leaf lamina area, leaf

thickness, leaf mass per area, leaf tissue density and C: N than the lianas. Lianas and trees in the studied site differed significantly in six out of seven leaf- functional traits analyzed, although they share similar environmental conditions. This fundamentally different C-fixation strategy of lianas in TDEF could offer competitive advantage over trees. Further, this syndrome of leaf attributes (acquisitive strategy) of lianas may also explain the increasing trend in lianas in TDEFs and in similar ecosystems. The below-ground traits, particularly the deep root systems of lianas are reasoned for its growing abundance in seasonal forests with constraints for water, however the observed patterns in the present study warrants the need for inclusion of leaf functional strategies, for the better understanding of biological mechanisms favoring lianas at least in seasonal forests.

RSR-6: In vitro flowering and ex situ conservation of *Dendrobium panduratum* var. *panduratum* Hook. f.- an epiphytic orchid from Western Ghats of Tamil Nadu.

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Dendrobium panduratum var. *panduratum* Hook. f. (Orchidaceae) is an epiphytic orchid with horticultural value, and it needs special attention for conservation owing to climatic changes and lower germination rate in natural conditions. The present study aims to develop the standardized protocol for asymbiotic seed germination of mature seeds, in vitro flowering and reintroduction into its original habitats. Total 12 types of nutritional media and various plant growth regulators were used to identify the best suitable medium for seed germination. Knudson C and half strength Murashige and Skoog (MS) medium were found suitable for seed germination (>90 %), further seedling development was well observed at modified MS medium, whereas Knudson C medium was not suitable. Several factors like plant growth regulators, organic additives and photoperiod also tested for in vitro flowering. Pre-treatment of developed seedlings in 24 h light period for 40 days in modified MS medium gave rise of flowering in in vitro seedlings above 93.65 % frequency. Present study developed towards asymbiotic seed germination and in vitro flowering of*D. panduratum*, which helps to create in vitro bouquets.

RSR-7: Assessment of populations, habitats, biology and threat status of *C. wightii* (Arn.) Bhandari in Indian arid zone

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Commiphora wightii (Arn.) Bhandari (Burseraceae) a valuable medicinal plant is getting depleted for oleo-gum resin. Comprehensive study was initiated to assess its habitats, population status, biology and threat status; the results are presented here. Area of occurrence predicted by Ecological Niche Modelling was visited for assessing its population. Its density was low (2-5 plants/ha) in southeast Rajasthan compared to western Rajasthan (8-10 plants/ha). Its 20 accessions are registered with NBPGR. Soil samples from 48 sites analyzed for soil texture, EC, pH, available potassium, available phosphorus and total nitrogen revealed that 200-300 kg/ha potassium favoured its better density and health. Being ecologically co-dominant, it survives best under canopy of suitable tree associate. Its density of 200 plants/ha emerged as the most appropriate for success in reintroduction. Seasoning of stem cuttings for four to five days in August month emerged as most optimum for sprouting and survival in field (50%) and achieved maximum height. For large scale multiplication, stem cuttings treated with IBA (5000 ppm) sprouted maximum (86%) and produced maximum total biomass. Based on our extensive survey at 604 sites in western Rajasthan, area of occupancy (AOO) calculated by IUCN grid cell method was 272 km 2. Temporally its population reduced by 56.25% in the past 12 years. Accordingly *C. wightii* has been placed under 'Endangered' category' regionally in North West India following IUCN Red List guidelines. For its reintroduction Jaisalmer and Barmer districts emerged as potential areas.

RSR-8: Standardization of propagation methods and reintroduction of some endemic and endangered plants to natural habitats in Eastern Ghats of India

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Wild populations of threatened plants are getting severely depleted due to a number of extrinsic factors such as habitat degradation, climate change and biotic

disturbances, as well as intrinsic factors like reproductive failure, genetic drift and demographic stochasticity. The reinforcement of depleted populations through reintroduction of nursery-raised plants in natural and near-natural habitats helps in establishing viable and self-sustaining populations for long-term survival of the threatened species. Of the roughly estimated 3,000 plant species in Odisha, more than 100 taxa have been identified as threatened species with varying levels of threat. In the present work, successful methods of propagation of *Lasiococca comberi*, *Polyalthia simiarum* and *Hypericum gaitii* from seeds and vegetative multiplication techniques through rooting of stem cuttings in *Cassipourea ceylanica* and *Dimorphocalyx glabellus* have been achieved. While seeds of *H. gaitii* germinated well in a medium containing sand, soil and FYM in equal proportions between 12-18 days of showing, the seedlings didn't survive beyond 2-leaved stage. In case of *L. comberi*, freshly collected seeds showed more than 46% germinability after 8-10 days. Rooting could be induced in 2-year old stem cuttings of *Cassipourea ceylanica*and *Dimorphocalyx glabellus* by treating them with 2000 ppm and 2500 ppm of IBA respectively and plantlets so raised could be acclimatized and hardened in large-scale under mist-house conditions. More than 2,500 plants raised in nursery have been reintroduced in Khurda, Phulbani and Chandaka Wildlife Divisions of Odisha and their survival and growth performance are being recorded regularly.

Prof. K. S. Manilal Award

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KS-1: An account on genus *Portulaca* l. (Portulacaceae) from Bagalkot district (Karnataka, India) with two new species

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Portulacaceae Juss. or purslane family is one of the important families adapted for arid regions due to its peculiar physiology and water harvesting system. It has a cosmopolitan distribution, with the highest diversity in semiarid regions of the Southern Hemisphere in Africa, Australia, and South America. According to latest classification system the family is represented by only genus *Portulaca* L. with near about 116 taxa in world. In India the genus is represented by 7 taxa including 6 species and one variety. Sivarajan who revised Indian Portulaca for first time and recognized only 5 species. He kept *P.grandiflora* as a subspecies of *P. pilosa* L. and *P. tuberosa* L. as a variety of *P. pilosa* subsp. *pilosa*. Bagalkot a district from northern Karnataka falls under drought prone area. During floristic exploration in Bagalkot district authors have recorded all the species of *Portulaca* L. present in India with two additional interesting taxa from Badami Hills. One of two interesting species is annual slender, erect herb, usually with cleistogamous flowers allied to *Portulaca pilosa* and *P. oleracea* var. *linearifolia* Sivarajan & Minilal. Second one is very robust, scandent, woody, subshrubs with dark pink to red flowers allied to *Portulaca suffrutescens* Engelm. In present work all species of *Portulaca* are described and keys for identification, detailed morphology, seed micromorphology, distribution, phenology and ecology have been provided.

KS-2:Floristic diversity of Alpine Sanctuary (Shingba Rhododendron WLS), Sikkim

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The Shingba Rhododendron Sanctuary (27° 42' 06" to 27° 50' 35" N and 88° 44' 21" to 88° 42' 51" E), spreads over an area of 43 km^2, and is located between the Lachung and Yumthang valley in the North Sikkim, Eastern Himalaya, India. The April-May

month is regarded as the best time to visit, when rhododendrons blossom to their apex in the sanctuary. It is enclosed by Chomzomei Tso broadening up to Lava pass in the west. To its south, it is delimited by the angelic Yumthang Valley that is renowned for its alpine meadow and sublime beauty; whereas in the east, it is bordered by Chuba - Sagochen mountain ranges. It is also embraces the Yumthang River that flows through its periphery. On the banks of river, one can trace long queues of Rhododendron trees and shrubs (Acharya *et al.,* 2010).

The present work enumerates 530 species, subspecies & variety belonging to 234 genera under 80 families. The Dicotyledons is represented by 431 species, subspecies & variety belonging to 183 genera under 68 families and Monocotyledons is represented by 99 species, subspecies & variety belonging to 51 genera under 12 families. Ericaceae is the most dominant family of this area represent by 64 species belonging to 9 genera. *Rhododendron* is the most dominant genera of this area.

During the study, *Diapensia purpurea* has reported new for Indian flora (Purohit, 2015); *Ponerorchis puberula* (King & Pantl.) Verm.recollected (Purohit, 2016); five plant species i.e. *Acrachne racemosa* (Heyne ex Reom. & Schult.)Ohwi, *Digitaria bicornis* (Lam.) Roem.&Schult.,*Poa supina* Schard.,*Rhododendron cephalanthum* Franch. and*Rhododendron tubiforme* (Cowan & Davidian) Davidian were reported additions for the flora of Sikkim state (Purohit, 2017).

During the field survey, collected 32 plant species were threatened and also prepared their species distribution maps with the help of Arc-GIS software and collected field & literature data.

KS-3:Taxonomic revision of the genus *Mucuna* Adans. (Leguminosae) in India

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The genus *Mucuna* Adans.is pantropical in distribution with ca.105 species. Lewis et al (2005) has reported 80 species in Asia and China; two species from in Australia; 12 species from Africa, Madagascar, Mascarenes and 13 species from Americas and Caribbean. For Indian subcontinent genus *Mucuna* was revised by Wilmot-Dear (1987) and reported 9 species and 2 varities. Later Sanjappa (1992) enumerated 11 taxa from India which also included nine species and 2 varities. A taxon *Mucuna pruriens* var.thekkadiensiswas described by (Thothatri and Ravikumar in 1997)

which was later reduced to synonym of *Mucuna pruriens* var. *hirsuta* by Krishanraj and Mohanan(2012). A new species *M. sanjappae* was described by Aitawade and Yadav (2012) from Northern Western Ghats. Recently two new species were described viz. *M. laticifera* (Ingalhalikar et. al., 2017) from Sikkim and *M. yadaviana* (Gaikwad et. al., 2018) from Andaman and Nicobar Islands. Till date there are 11 species and 3 varities of *Mucuna* found in India. Present paper deals with the two new species, Nomenclature issues, new record to state, geographical distribution of species, ecology and seed morphology of *Mucuna* species from India.

KS-4: Taxonomy and Biogeography of grass genus *Trachy* spers.

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Trachys Pers.was erected as amonospecific genus in the tribe Paniceae, of subfamily Panicoideae and family Poaceae with type species, *T. muricata*(L.) Pers. Later, *Trachy scopeana*Kabeer& V. J. Nair,*T.narasimhanii*Ravichandhran, *T. deccanensis* M. Anil Kumar & B. R. P. Rao were added to the genus. All the four species of *Trachys* have been confined to India, Myanmar and Sri Lanka; of these, *T. copeana, T. narasimhanii* and *T. deccanensis*are endemic to India and *T. muricata* is distributed in India, Myanmar and Sri Lanka.The genus is characterized by stoloniferous habit, hairy-tomentose leaves, 1-3 spike like racemes, fragile leafy rachis, clusters of spikelets disarticulating along with rachis as segments. While *Trachy scopeana*and *T. narasimhanii*usually found in coastal areas and sandy soils,*T. deccanensis*and *T. muricata* are usually found as weedsof cultivated fields during or after crop harvesting. For the purpose of the conference, the first author presents the taxonomy, biogeography and interrelationship of the species of *Trachys.*

KS-5: Status of Orchidaceae in Gujarat

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Orchidaceae are one of the largestfamily of flowering plantfeaturing incredible range of biodiversity related to their floral and vegetative features. Gujarat is a conjunction

of complex ecosystem which includes Western Ghats, Semi-arid and arid zone.The combination of various types of complex ecosystemin this region results into diverse flora and fauna.The present study is aimed to provide complete inventory of orchids in Gujarat with emphasis on their current distribution pattern and host specificity for epiphytes. A total of 35 species with 15 genera are reported from Gujarat. The study resulted in 30 species of orchids representing 13 genera,among them 12 are epiphyte, 17 are terrestrial and one is lithophyte.*Habenaria,* the third largest genus of the family in Indiais also a dominating genus in Gujarat. Among the 30 reported species, five are first time recorded from Gujarat, namely *Aerides ringens*, *Geodorum laxiflorum*, *Habenaria rariflora*, *Oberonia mucronata* and *Peristylus constrictus*.The distribution pattern of orchids in Gujarat showed that Western Ghats region of Gujarat represents maximum orchid diversity as compared to Semi-Arid Zone.*Geodorum laxiflorum* is reported as a new distributional record for Western Ghats.The evaluation of rarity status revealed that 20% species of orchids are very rare, 40% are sparse, 23% are occasional and 17% are common in Gujarat.

KS-6:*Begonia* L. sect. *Reichenheimia* in India

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The genus *Begonia* L. (Begoniaceae)is the sixth-largest genus of flowering plants in the world with *c*. 1896 species (Hughes *et al*. 2015–). In India, the genus is represented by 56 species (Uddin 2007). A total of 70 sections were recognised under this genus, of which 9 are known from India (Moonlight *et al.* 2018). *Begonia* sect.*Reichenheimia* (Klotzsch) A.DC.*sensu* Doorenbos *et al*. (1998) mainly comprises of tuberous or rhizomatous plants with short or acaulescent stem and trilocular ovary with undivided placentae. Moonlight *et al*. (2018) reduced this section by segregating Malesian rhizomatous species and some continental Southeast Asian and Chinese species in to a new section, sect. *Jackia* M. Hughes. At present the sect. *Reichenheimia* encompass 20 species world-wide, including the 6 species (*B. albo-coccinea* Hook., *B. floccifera* Bedd. *B. phrixophylla* Blatt.&McCann, *B. trichocarpa* Dalzell., *B. subpeltata* Wight and *B. tenera* Dryand.) from India. As part of the revision of *Begonia* in India, extensive explorations were conducted throughout the country and a number of species were collected from the wild, and most of them were grown in Calicut University Botanical Garden for further

observations. The present treatment deals with the taxonomy of sect. *Reichenheimia* in India with the description of two new taxa.A key for identification for the sect.*Reichenheimia* and illustration, notes on habitat and ecology of the taxa treated under this section are also provided.

KS-7:Taxonomy of the genus *Osbeckia* L. (Melastomataceae) inIndia

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The genus *Osbeckia* L. is a major genus of the family Melastomataceae consisting about 50 species worldwide (Mabberley, 2017). Linnaeus (1753) described the genus *Osbeckia* for the specimens brought by Pehr Osbeck from Canton in China to Sweden (Hansen, 1972; Hansen & Fox Maule, 1973). The name '*Osbeckia*' was coined by Linnaeus in honour of Pehr Osbeck (1723-1805) and published in *Species Plantarum*. The genus is well represented in India with 26 species (Clarke, 1879) of which 20 occur in South India (Gamble, 1919). Taxonomic revision of *Osbeckia* L. deserves special attention becauseIndia owns more than 50% of species worldwide and the genus shows sizeable percentage (63%) of endemism in India. Exempting the treatment of Clarke, (*l.c.*) in The *flora of British India*, the genus is taxonomically ignored in India. Though Hansen (1977) revised the genus for Asia, the work is primarily based on herbarium specimens rather than live specimens or field study. At present the genus is represented in India with 23 species and 4 varieties. This study includes one new species for India, one new distributional record for South India, seven new synonyms and eight lectotypifications. Detailed descriptions, distribution, endemism, IUCN categories, conservation status and photographs are provided.

KS-8:Lateritic plateaus of Northern Western Ghats – Are they really barren lands?

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Lateritic rocky outcrops in northern Western Ghats, are either plateaus or table-lands. Commonly they are known as '*Sada*' or '*Katal*'. The scientific attention on lateritic

plateaus are gaining momentum over the last decade owing to its unique habitat formation for both flora and fauna. Despite their importance in supporting wide group of herbaceous plants including endemics, only few studies have been carried out so far. Hence the present study was attempted to check the extent of herbaceous endemic species richness of lateritic plateaus in northern Western Ghats. The present work has been carried out in two phases. Phase I involved the collection of published information from northern Western Ghats, especially of those dealing with new taxa. Results revealed that most of the herbaceous new taxa described are inhabitats of lateritic plateaus and are endemic. Phase II involved extensive field visits (October 2015 onwards) for documenting herbaceous endemic taxa from lateritic plateaus of Goa and South Konkan. A total of 161 herbaceous endemic taxa has been documented so far from Goa and South Konkan. Poaceae was the most speciose family with the representation of 49 endemic species. The study also revealed some important findings such as, new species, rediscovery of rare taxa and extended distribution of newly reported taxa. The extent of herbaceous endemic plant diversity in lateritic plateaus recorded in the present study, demands several critical and intensive studies in future for better insights.

KS-9:Taxonomic revision of the genus *Anisochilus*(Lamiaceae) in Western Ghats

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Anisochilus Wall. ex Benth. is a genus of herbs and shrubs belonging to the subtribe Plectranthinae, in tribe Ocimeae, subfamily Nepetoideae (Harley *et al.* 2004). It is characterised by the spike-like head with early caducous bracts and unequal calyx lips. The posterior lobes of the fruiting calyx decurved to conceal the throat after anthesis. Most species in this genus have a decurved corolla tube with declinate stamens and confluent anthers. Bentham (1848) divided the genus into 2 sections based on calyx characters: section *Anisochilus* Bentham with 4/5-toothed calyx, posterior calyx lip ovate and decurved, anterior lip truncate, and section *Stiptanthus* Bentham with 5-toothed calyx, teeth incurved and oblique, uppermost tooth elongate and incumbent. *Anisochilus* is predominantly an Asian genus with 21 species distributed chiefly in Bhutan, Burma, Cambodia, India, Laos, Southern China, Sri

Lanka, Thailand and Vietnam. Of these 18 species are from India. The present study focused on the taxonomic revision of the genus in Western Ghats. Altogether 15 species including 9 endemic species are identified in Western Ghats which includes more than 70% of the taxa so far known in the genus. This study identified two new species and reinstated two species names and proposed a new synonym to *Anisochilus carnosus.*

KS-10:Diversity and endemism of *Plectranthus*-*Coleus* complex (Lamiaceae) in India

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Plectranthus L'Hér.is one of the largest genera of Lamiaceae, plays an important role in both horticulture and traditional medicine. Taken in a broad sense and as per recent treatments of the genus, it consists of ca. 360 species in the Old World Tropics. Nineteenth century works treated *Plectranthus* species under two distinct generic names *Coleus* Lour. and*Plectranthus*. However, recent studies treated *Coleus* as congeneric with *Plectranthus*. Paton *et al*. (2004) presented a phylogeny of tribe Ocimeae based on three plastid regions, demonstrating that the Plectranthinae, the subtribe containing *Plectranthus*, was a monophyletic group. The study also identified two main clades within the Plectranthinae: one containing the type of *Coleus* and the other containing the type species of *Plectranthus*. A recent study of Indian *Plectranthus* by the authors also proved to be highly congruent with Paton *et al*. (2004). The results suggested that majority of the Indian *Plectranthus* are nested within the *Coleus* clade and all Indian endemics are confined to Southern Western Ghats, suggesting a recent radiation in that region. The study also point out that several of these species were likely to be threatened. The present investigation was focused on the taxonomic revision of this complex in India and identified 22 species including five new species and eleven endemics. Nomenclatural confusions including taxonomic reinstatement, synonymization and lectotypification of many species were clarified as part of this study. This is the first contribution towards a comprehensive morphological and phylogenetic investigation of the genus *Plectranthus* in India.

KS-11: Taxonomy of the genera *Heteropogon* and *Pseudanthistiria* (Poaceae) in Peninsular India

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Heteropogon Pers. and *Pseudanthistiria* (Hack.) Hook.f. are the two major genera in the subtribe Anthistiriinae of Poaceae. This subtribe is distinguished by a pointed callus applied obliquely to the internode tip rather than blunt and sunk into it (Clayton & Renvoize, 1986). *Heteropogon* is known to have 6 species worldwide. It is distributed throughout the tropical and subtropical regions of the World. While *Pseudanthistiria* comprises 3 species worldwide and have distributed in India and Sri Lanka to Thailand. Previously 8 species of the above genera were known to occur in Peninsular India. Our study report 9 species as occurring in Peninsular India with the reinstatement of *Heteropogon allionii*. Key for identification, description, phenology, distribution, endemism and photographs are provided.

KS-12: Taxonomic revision of *Zingiber* section Cryptanthium (Zingiberaceae) in India

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The genus *Zingiber* Miller (Zingiberaceae) includes perennial rhizomatous herbs. It is distinct from other genera of the family by the presence of a single anther with a beak or hook- like appendage which embraces the upper part of the style. They are distributed mainly in tropics and subtropics with the centre of distribution in the indo-Malayan region but extending through tropical Africa to central and South America (Kress et al 2002), with about 150 species all over the world (Wu & Larsen, 2000; Kishor and Leong-Skornickova, 2013). In India the genus is represented by 30 species (Joe et al, 2017) under 4 infrageneric sections (1) sect. Cryptanthium Horaninow (1862), having a radical inflorescence with short peduncle; (2) sect. *Zingiber* with long erect peduncle; (3) sect. Pleuranthesis Benth. (1883) characterized with a spike emerging through the leaf sheath and (4) sect. Dymczewiczia with terminal inflorescence (1883: 634).Among this Sect. Cryptanthium is the largest section in India represented by 16 species. The genus is less understood taxonomically and biologically as many taxa grow in dense forests during monsoon.

As the genus shows high diversity, rich endemism, and great economical potential, taxonomic revision has been undertaken. Present studies deals with, detailed morphology, taxonomy, distribution, ecology, endemism, IUCN status and photoplates of the Sect.Cryptanthium only. Present studies revealed that 16 species occur in India including seven new taxa published recently of which three species are endemic to south India and 9 to North East India.

KS-13:Floral peculiarities in some members of Asteraceae

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Asteraceae is one of the largest families in angiosperm. Of these 900 species are found in India. Out of which 101 species are found in Gujarat. As there are many intricacies in Asteraceae family an effort was made to understand 31 species of Asteraceae occurring in Gujarat. The characterization primarily deals with the floral characters i.e., types of heads (inflorescence), involucre bracts, types of flowers, pappus, anthers, style and cypsela. The 30 species studied belongs to 13 tribes viz., Cichorieae, Anthemideae, Cynareae, Senecioneae, Millerieae, Eupatorieae, Helenieae, Coreopsideae, Gnaphalieae, Inuleae, Astereae, Heliantheae, Vernonieae.

Prof. T.R. SAHU AWARD

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TRS-1: Chemotaxonomic studies on the genus *Alpinia* in India using GC-MS

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Alpinia is one of the largest genera of the family Zingiberaceae with about 230 species, mainly distributed in the Indo-Pacific region. These aromatic plants produce beautiful inflorescence and are widely used as ornamental, furthermore they have extensive medicinal value. *A. calcarata* and *A. galanga* are well known for their medicinal value, which are used in traditional medicines, Ayurveda and Unani. Rhizomes of both are popular remedy for many respiratory ailments. Rhizomes of *A. mutica, A. blepharocalyx* and *A. zerumbet* are used against stomach ache in many folk medicines. The present study deals with chemosystematics of Indian *Alpinia* based on GC-MS analysis. Rhizome of 13 indigenous species, 3 exotic species and 2 artificial hybrids were used for the analysis and about 80 major active compounds were identified. Terpinoids are the major compounds observed in all taxa. However, their concentration varies from one taxon to another. These can be used as species delimiting characters and have great importance in systematics. This makes it important to understand the taxonomic distribution of the compounds. The phytochemical screening of the rhizomes of *Alpinia* spp. provides additional information which can enhance their medicinal value. Dichotomous key and a dendrogram are constructed based on chemical compounds present in each species.

TRS-2: Phytochemistry of *Amentotaxus assamica* Ferguson.-A potential member of Taxaceae

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Amentotaxus assamica belongs to the family Taxaceae which includes four other genera viz. *Taxus, Pseudotaxus, Austrotaxus* and *Torreya.* In Arunachal Pradesh only *Taxus* and *Amentotaxus* have been recorded only, having one species each. The present study was carried out to investigate the major phytochemical constituents as

well as the green synthesis of the silver and gold nano particles. The antimicrobial and the antioxidant activity of both leaf and crude extract of the *A. assamicus*was also undertaken. GCMS analysis of both leaf and bark methanol extract revealed that more than 60 compounds in both leaf and bark extracts which have potential bioactivity. The most prevailing major compounds identified in the polar fraction were 9, 12, 15-Octadecatrienoic acid, (Z,Z,Z)- (19%), pentadecanoic acid (12.60%), momeinositol (5.27%), 1,2-benzenediol(2.54%) and cyclopentanol (2.16%). From the NMR study of the methanol extract one new diterpenoid compound was isolated from the leaf of *Amentotaxus* assamica namely 3β, 23β-dimethoxycycloartane-24(24')-ene. The structure, including the relative configuration, was elucidated from both hydrogen and carbon NMR including DEPT spectroscopic data. From the LCMS study the molecular mass of the compound was found 507.0 D. Molecular docking of the isolated compound, 3β, 23β- dimethoxycycloartane-24(24')-ene proved that the compound is active against two different protein (BRECA1) responsible for cell Brest cancer cell line and HepG2 cell line. Antimicrobial and antioxidant activity of the extract also proved that *A. assamicus* is a good source of probable drug. So proper conservation measures of *Amentotaxus assamica* should initiated so as to check its exploitation.

TRS-3: *Taverniera cuneifolia* (Roth) Ali, a potential substitute for artificial sweetener from Indian perspective

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Glycyrrhizin is a potential phytochemical used for bronchitis, asthma, peptic ulcers, gastritis,rheumatism, allergies, inflammation, and sore throat and in recent years the usage of glycyrrhizin has increased owing to its excessive use in cosmetic and herbal industries. Similarly the use of glabridin in cosmetic industries has been famous since years because of its skin whitening properties as well as it is a major polyphenolic flavanoid with anticancer and antioxidant properties found in *Glycyrrhiza glabra* L. The genus *Taverniera* belongs to the family of Fabaceae and includes 16 species. It is endemic to the Northeast African and Southwest Asian countries. The Asian species of *Taverniera*, *Taverniera cuneifolia* (Roth) Ali.is often referred to as Indian licorice owing to its sweet taste. *Taverniera cuneifolia* is locally known as desi Jethimadh and it is used by the tribal's of Barda Hills of Jamnagar inWestern India. It is used as

a substitute of Licorice or in other words a substitute of *Glycyrrhiza glabra*. The investigation was carried out to determine the presence of glycyrrhizin and glabridin in *T. cuneifolia*. With the above context the analysis methanolic extract of roots, stem, leaves, fruits and seeds was done using LC-MS and HPTLC. With the confirmation of Glycyrrhizin in *T. cuneifolia,* LC-MS method was developed for quantification of glycyrrhizin from plant powder. The similar work has been done on HPTLC instrument by using the methanolic extract of plant sample. The analysis revealed the presence of glycyrrhizin and glabridin in roots, stem, leaves, fruits and seeds. The study confirms that the *T. cuneifolia* can be a potential substitute of *G. glabra.*

TRS-4: *Strobilanthes callosa* Nees a potential medicinal plant, an alternative for *Strobilanthes ciliata* Nees (vulnerable endemic plant) from Western Ghats of India

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In Ayurveda, Strobilanthes ciliata Nees [IUCN Red List status: Vulnerable (VU)] is widely used as an important medicinal plant and acts as a main ingredient in the formulations. The healers and local Adivasi use this plant in the treatment of inflammatory disorders, arthritis, microbial diseases, treatment of spider poison and various other ailments. A chemical investigation is a significant tool in understanding the compounds to generate knowledge about its richness through its Phytochemicals. In various parts of our county, different species of *Strobilanthes* are been used in the medicinal formulation of 'Sahachara' hitherto giving similar results. This encouraged us to investigate and quantify the major compound. Gas chromatography-mass spectrometry profiles showed 'Lupeol' as a major constituent in five *Strobilanthes* species viz. *S. callosa* Nees, *S. ciliata* Nees, *S. integrifolia* Kuntze, *S. ixiocephala* Benth. and*S. heyneana* Nees. The extract was applied on tlc aluminium-backed plates pre-coated with silica gel 60 F 254 and HPTLC profile for quantitative analysis of Lupeol, was compared for µg/200 mg in leaf and stem respectively. The current study confirms the presence of Lupeol in leaf (less than in stem), with *S. callosa* stem (553 µg/200 mg of sample), whereas, *S. ciliata* stem (197.9 µg/200 mg of sample) and claims that an alternate to *S. ciliata* (vulnerable species) the *S. callosa*(abundantly

found in Western Ghats of India) could be exploited as it contains bioactive Lupeol content more than *S. ciliata*. This study will reduce the pressure of overexploitation of vulnerable species *S. ciliata* in the ayurvedic formulations.

TRS-5: Fatty acid profiling in the genus *Leucas* (Lamiaceae) and its medicinal importance

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Lamiaceae, commonly called as Mint family, is one of the largest families among dicotyledons, being composed of more than 236 genera and 7173 species. The family is of outstanding importance in its use in indigenous medicine used by people world over, particularly in Indian cultures and tradition. Plants of genus *Leucas* are widely used in traditional medicine to cure many diseases such as cough, cold, diarrhoea and inflammatory skin disorder. Anti-inflammatory, analgesic, antidiarrhoeal, antimicrobial, antioxidant and insecticidal activities have been reported in the extracts of these plants and their phytoconstituents. Present study represents the only comprehensive phytochemical investigation on this genus based on fatty acid profiles. The leaf fatty acid compositions of 18 species and 2 varieties of *Leucas* were analysed for nutritional, pharmaceutical and chemotaxonomic perspectives. We observed major fatty acids as palmitic, stearic, linoleic and linolenic acid; whereas myristic, palmitoleic, oleic, cis-vaccenic, laballenic, eicosanoic, eicosenoic, phlomic and docosanoic acid were detected in minor quantities. Laballenic and phlomic acids are unusual allenic fatty acids found in few Lamiaceae members from order Lamiales. Laballenic acid, a proven molecule of pharmaceutical importance, was observed in all the *Leucas* species studied. GCMS results shows that *Leucas* is rich in Alpha Linolenic acid and this omega-3 fatty acids are essential for normal growth and development and may play an important role in the prevention and treatment of coronary artery disease, hypertension, diabetes, arthritis, other inflammatory and autoimmune disorders, and cancer. A multivariate analysis was performed out of 11 fatty acids in order to investigate a possible relationship among the different *Leucas* species. Two species *L. sebaldiana* and *L. ciliata* were grouped on the basis of higher

quantity of laballenic acid and lesser quantity of Linolenic acid compared to other species. Multivariate analysis on the chemometric data also supported this cluster as the most prominent source of medicinally useful laballenic acid.

TRS-6: Stem anatomy of some species of *Dioscorea*L. occurring in Gujarat state

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The medicinal value of *Dioscoria* lies in the bioactive phytochemical constituents of the plant and which shows various physiological effects on human body. A species of *Dioscoria* are of economic importance as tuberous food crops. A tuber contains reserved food, mainly starch and is incorporated into human diet. Stem anatomy of six species of *Dioscorea* were investigated in the present study to identify them in absence of reproductive structures. Six species of *Dioscorea* are reported to occur in Gujarat and it is defficult to identify them in absence of reproductive structures. Moreover, the genus is characterized by presence of separate male and female plants. The vascular bundles in *Dioscorea* are distributed into rings, from which the external ring is being formed by common vascular bundles while the internal ring is formed by cauline vascular bundles. Moreover, the internal bundles are smaller in size while the internal bundles are larger in size. The vascular bundles in this genus are distributed into rings, from which the external ring is being formed by common vascular bundles while the internal ring is formed by cauline vascular bundles. The external bundles were smaller in size while the internal bundles are larger in size. In the present study it was observed that in *D. alata, D. bulbifera, D. hispida, D. opposotifolia, D. wallichii*, have only a single ring of vascular bundles. Formation of phloem anastomosing is common within the adjacent vascular bundles. Details of the xylem and diagnostic key at species level identification is also provded herewith on the basis of anatomical features.

TRS-7: Studies in ethnomedicinal plants of Jungle Mahal area of Bankura district, WestBengal

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Present study embodies the observations on traditional uses of ethnomedicinal plants by the tribal people of Jungle Mahal area of Bankura district, West Bengal. Information regarding various uses of ethnomedicinal plants was recorded through semi-structured interviews with 22 indigenous herbal specialists of the ages range from 41 to 80 years. Before data collection Prior Informed Consent (PIC) has been taken from the informants in written form. Information on local name of the plant species, plant parts used, preparation and administration of the crude drug, and ailments cured were documented. In total, 77 plant species were recorded which are used in 63 types of herbal formulations for curing 43 types of health conditions. Here, a quantitative index called Informant Consensus Factor (ICF) has been employed to find out the most important medicinal plants used by the tribal people of the study area. The ICF value was found highest for the disease category of injury and poisoning (0.915), followed by the categories of digestive system (0.904), infections (0.897), cardiovascular (0.889) and diseases of the skin (0.886), etc. Scrutiny of relevant literature on ethnobotany revealed that out of 63 types of formulations, 20 types are found new in respect of diseases cured and 5 formulations are identified as new in respect of plant parts used as they have not been reported earlier. The observations of this study will enrich the database on ethnomedicine of our country and will help in selection of most important ethnomedicinal species for their scientific validation of the recorded therapeutic remedies.

Prof. S.R. Yadav Award

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SRY-1: *Afrohybanthus puberulus* (M.Gilbert.) U.B. Deshmukh (Violaceae): A new distributional plant record for Maharashtra State, India

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During floristic work in Chandrapur and surrounding some interesting specimens of a*Afrohybanthus* of Violaceae family collected. After relevant literature survey and observation, it was found that the specimen matches the description of material identified as *Afrohybanthus puberulus* (M.Gilbert.) U.B.Deshmukh leading to reporting a new distributional plant record for Maharashtra state. In the present study, taxonomic description, images, distribution, and taxonomic key provided for further easy identification of species.

SRY-2: An integrated approach to solve taxonomic problems in *Justicia* Sect. Rostellaria in India

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Justicia L. with ca. 700 species (Daniel 2016) is the largest genus within the tribe Justicieae of family Acanthaceae. The major centre of diversity is in new world (ca. 500 spp.) whereas the Old world *Justicia* comprises less than 30 % of the total diversity. Within the old world, India is one of the species diversity centre having high endemism. More than 55 taxa (including 53 species and 5 varieties) are already reported from this region. Indian species are included under five sections and among these, Sect. Rostellaria is the largest and highly complex group with 13 species and 3 varieties. Species delimitation in Rostellaria is difficult due to the high level of morphological variations within and between species, associated with the wide range of distribution. A taxonomic study of this section based on field collection of specimens from different parts of India and consultation of herbarium from inside and outside the country indicates high level of polymorphism. This shows that mere morphologic comparison is not adequate in circumscribing taxa boundaries within

this complex. Hence, we followed an integrated approach using data from gross morphology, anatomy, micromorphology, and molecular phylogeny to solve taxonomic problem within the Sect. Rostellaria and the results are presented here as a case study.

SRY-3: In-depth study on the Inflorescence architecture in subtribe Ischaeminae Presl. (Tribe Andropogoneae, Family Poaceae) from India

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Ischaeminae Presl. is one of the endemic subtribe and represented by ca. 62 species of 6 genera in India, of which 45 species were collected for the present study.*Ischaemum* (53),are the larger genera followed by *Sehima* (4), *Apluda* (2); whereas, *Triplopogon*, *Thelepogon*, *Pogonachne* are the monotypic ones. The monophyly of Ischaeminae is supported by molecular data. The subtribe lacks obvious morphological synapomorphies although the typological analysis turns out to be very useful to assess the degree of morphological differentiation in Andropogoneae. To accomplish this purpose, synflorescences of all the studied taxa were typologically investigated and its systematic value discussed in detail. In all the species studied, synflorescence is found to be polytelic and truncate. Different species presents floriferous shoots with complex systems of ramification, at the level of the distal leaves, subtending leaves and developed prophylls. *Ischaemum* possess a reduced inflorescence (V-shaped) and a proliferation of branching described as false panicle. *Apluda* were distinguished as having triplet of spikelet arranged in racemes as an UIF & CoF arranged in prophyllar branching. In *Thelepogon* pedicelled spikelet is absent, whereas the sessile spikelet reduced/absent in *Pogonachne*. Genus *Sehima* lacks prophyll in the axil, hence there is no branching and synflorescence bears UIF only. *Triplopogon* contains UIF and Cof with excessive prophyllar branching on its main axis. A sister group relationships of Ischaeminae Presl.with SaccharinaeGriseb., Germainiinae Clayton, Dimeriinae Hack. & Coicinae Reichenb.andpossible hypothetical evolutionary trends for inflorescence development are also discussed in detail.

SRY-4: Diversity, distribution and ethno-botany of wild edible food plants used by the tribals of Rayagada district, Odisha, India

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Odisha is home to as many as 62 tribal communities including 13 primitive tribal groups. The majority of the tribal population live inside forests or fringe villages and depend heavily on wild forest food and biomass for their livelihood. The wild plants and plant parts gathered from nearby forests in different seasons contribute significantly to the food and nutritional security of the poor tribals especially at the time of food scarcity. They are aware of the edibility of the species, seasonality and the processing methods as an age-old practice. However, with modernization and settled agriculture, the ethno-botanical knowledge is being lost, which need proper study and documentation leading to identification of new sources of food, medicine and neutraceuticals. Rayagada district of Odisha has a unique position in terms of its tribal population dominated by Soura and Kandha tribes and rich forest wealth. An ethnobotanical investigation was carried out in the district to explore the traditional uses of edible plants by local inhabitants through structured PRA exercise and informal consultations. The present study recorded less-known uses of 62 plant species, which includes 14 species used as fruits, 16 species as green vegetables and 11 taxa producing edible roots/ tubers. Besides, seeds of 6 plant species and 6 edible mushrooms are consumed by the tribals. While *Celosia argentea*, *Cassia tora*, *Amaranthus virdis*, *Amaranthus spinosus* are the commonly used leafy vegetables in different seasons, the tender fronds of the aquatic fern *Diplazium esculentum* is consumed in quantity during the rainy season. The edible tubers of many species of *Dioscorea* are collected for consumption and storage only after Nuakhai (harvesting) festival. Interestingly, the leaves and tender parts of the widespread weed *Blumea lacera* is also eaten as a distress food in certain tribal pockets. The present study emphasizes the need for documentation of traditional knowledge before it is lost forever.

SRY-5: Pollen morphological characteristics of some plant species from Quepem Taluka, Goa and their taxonomic importance

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During this study 52 plant species belonging to 24 families were collected from Quepem taluka, Goa for understanding their pollen morphological characters, diversity and taxonomic importance. The pollen grains were acetolysed for all plant species, observed and photographed under bright-field microscope to study and understand their size, shape, pollen characters and exine ornamentation patterns. The studied pollen grains were classified into large, medium and small sized. Large sized pollen grain was observed in *Hibiscusrosa-sinensis* (78-80µm) and small sized pollen in *Blepharis asperrima* (10µm). Among the plant species studied, 28 species showed circular shape pollen grains, triangulate shape in 9 species, 4 species with oval shape, 5 species with tetra-angulate shaped pollens and six plant species with ellipsoid, elongated, square, fassa-aperturate, polyad and rectangular shaped pollen grains. Among the plant species studied for pollen types, tricolporate type was dominant (9 species), tricolpate (4 species), triporate (4 species), hexacolpate (3 species), tetraporate (2 species), trisyncolporate (1 species), biporate (1 species), pentacolporate (1 species), hexacolporate (1 species) and trisyncolpate (1 species) pollen types were observed. The ornamentation patterns were studied for 47 plant species. The reticulate type of ornamentation was dominant and seen in 18 plant species, psilate pattern exhibited in 14 species, echinate type of ornamentation in 10 species, fine reticulate type in 4 species, one species each with clavate and perforate type of ornamentation pattern. This study provided a glimpse of pollen morphology of 52 plant species and some of the species are with unique pollen morphological characteristics which may be of importance and useful in solving some of the problems in taxonomy.

SRY-6: Diversity, distribution and phenology of forest trees of Odisha: Materials for a pictorial guide

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Trees are the largest and the most useful group in the plant kingdom and they form the major biotic component in the forest ecosystem of the world. Apart from providing food and beverages, shelter, fuel, medicine, oil, paper, rubber etc., trees provide numerous services for millions of years for the benefit of man and other animals. Trees also provide shelter and protection to numerous groups of plants and animals. The number of tree species (flowering plants and gymnosperms) in India is roughly estimated at 2,000. In Odisha, some 470 species of wild forest trees and exotics those thoroughly naturalised in forest ecosystems have been reported to occur. In the present study, first-hand information on distribution, phenology, ecology, associated taxa, use values, quantitative ecological data, regeneration potential of 250 tree species of Odisha belonging to 163 genera and 58 families have been collected and analysed. Of these, 24 species yield timber, 77 species provide edible items and 29 species are used for their medicinal properties. Attempts have been made to develop easily workable keys to segregate species/ groups based on macro-morphological characters such as flower colour, leaf morphology, fruit types, crown architecture, trunk and bark characteristics, seed morphology and later by referring to colour photographs of each plant and plant parts. This will serve as a handy tool for foresters, nature lovers, researchers, students and common man alike in Odisha and elsewhere.

SRY-7: Karyotype studies in some Indian *Argyreia* Lour. (Convolvulaceae)

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Karyotype studies have been done in four species of Indian *Argyreia*. The chromosome counts of *A. elliptica*, *A. osyrensis* and *A. setosa* are reported for the first time while somatic chromosome count of *A. cuneata* is confirmed. All of the studied species found to be diploid with chromosome count 2n=2x=30. Highest total chromosome length (TCL) in *Argyreiaosyrensis* was 54.25 µm with mean chromosome length (MCL) of 3.62 µm. The lowest in *Argyreiasetosa* as 46.04 µm with the mean chromosome length of 3.07µm. Stebbins categories were defined for

the karyotypes moreover; karyotype asymmetries analyzed employing various asymmetry indices.

SRY-8: Diversity of the genus *Pouzolzia* Gaud. (Urticaceae) in India

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Pouzolzia Gaud. is a non-stinging taxa of the 'nettle family', belonging to the tribe Boehmerieae. It closely resembles the genus *Boehmeria* Jacq. in gross morphology, but differs in having caducous stigma and an easily detachable fruiting perianth at maturity. Worldwide it is represented by 41 species and 9 varieties among which 27 species are found in the Old World and 16 taxa in the New World. The genus is subdivided into two sections *Pouzolzia* and *Memorialis* Benn. & R.Br. The section Memorialis is found only in the Old World. Ever since its establishment many names have been described from India by various authors. However, currently only 6 species and 3 varieties are recognized from India. The present study aims at studying the species diversity, distribution, endemism, and present status of all the species reported from India.

SRY-9: Study of Papilionaceus plants found from Gandhinagar, Gujarat,India

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Gandhinagar is located at 23.22° N 72.68° E. with 205 km 2 (79 sq mi) area . There are many types of angiosperm families are growing. We have taken papilionaceae family. This family is regarded as the second largest family of Dicotyledons. Present paper deals with 32 plant species is belonging to 21 genera, like *Abrus precatorius* L., *Butea monosperma* (Lam.) Taub.,*Cajanus cajan* (L.) Millsp.,*Canavalia gladiata* (Jacq.) DC., *Clitoria ternatea* L., *Crotalaria burhia*Benth.,*Crotalaria hebecarpa* (DC.) Rudd, *Crotalaria medicaginea* Lam., *Crotalaria foliosa*Wild.,*Crotalaria*

spectabilis Roth., *Cyamopsis tetragonoloba* (L.) Taub.,*Dalbergia sissoo* DC., *Desmodium gangeticum* (L.) DC, *Desmodium heterocarpon* (L.) DC., *Desmodium triflorum* (L.) DC, *Desmodium oojeinensis* (Roxb.), *Erythrina suberosa*Roxb.,*Gliricidia sepium* (Jacq) Walp., *Indigofera cordifolia* Roth,. *Indigofera linnaei* Ali, *Indigofera oblongifolia* Forssk.,*Medicago sativa* L., *Millettia peguensis* Ali, *Mucuna pruriens* (L.) DC., *Pongamia pinnata* (L.) Pierre ,*Pterocarpus marsupium* Roxb., *Rhynchosia minima*(L.) DC., *Sesbania sesban* (L.) Merr.,*Tephrosia purpurea* (L.) Pers., *Tephrosia subtriflora* Baker, *Tephrosia villosa* (L.) Pers., *Uraria picta (Jacq*.) DC, *Zornia gibbosa* Span.The collected plant specimens were identified with the help of Flora of Gujarat State (Shah, 1978) and another published literatures.

SRY-10: Observation of some valuable trees with their medicinal uses and chemical properties found from Gandhinagar, Gujarat, India

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Gujarat state is situated in central western part of India. Gandhinagar City is capital of the state of Gujarat. Total area of Gandhinagar is 205km 2 and 23.223 0 N 72.650 0 E. In Gandhinagar there are various types of trees, shrubs, herbs and climbers are grown. The present research paper deals with 11 valuable medicinal trees belonging with 11 genera and 11 species like *Cochlospermum religiosum* (L.) Alston, *Bixa orellana* L.,*Adansonia digita*te L.,*Calophyllum inophyllum* L., *Citrus medica* L., *Anacardium occidentale* L.,*Buchanania lanzan* Spreng.,*Couroupita guianensis* Aubl., *Cinnamomum tamala* (Buch-Ham.) T. Nees &C.H.Eberm.,*Bridelia retusa* (L.)A.Juss.,*Artocarpus heterophyllus* Lam. Medicinal plants are widely used in non-industrialized societies, mainly because they are readily available and cheaper than modern medicines. Plant species are observed and data were collected from some important places like Indrodapark, Vanchetana Kendra, Jawaharlal Nehru AyurvedicUdhyan and Punitvan. Different field trips were arranged in various seasons. All the different plant species having their own medicinal values. We have incorporate chemical properties of certain chemical constituents of each tree species. Present research work is useful for local people and also useful for awareness of valuable medicinal tree species. We have taken photographs of each species and indentify with the help of Gujarat flora(1978) and other literature.

SRY-11: Diversity, distribution and productivity of seagrasses of Chilika lagoon, Odisha asinfluenced by substrate characteristics and physico-chemical properties of water

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Chilika, the largest brackish water lagoon of Asia, is a unique assemblage of marine, brackish and fresh water eco-systems with estuarine characters. The diversity, pattern of distribution and abundance of aquatic macrophytes (including seagrasses) show considerable seasonal variation in four ecological zones of Chilika depending on depth of water, transparency and sediment characteristics. Seagrasses, marine flowering plants, are widely distributed in all sectors except Northern sector and play key ecological roles in lagoon ecosystems forming extensive meadows and supporting high biodiversity. Through extensive surveys from 20 selected sites in three seasons during the last three years, the occurrence of six seagrass species, namely *Halophila ovalis, Halophila ovata, Halophila beccarii, Halodule pinifolia, Halodule uninervis* and *Cymodocea serrulata* has been reported from Chilika lagoon. All the six species were found in the central sector but northern sector was devoid of any seagrass species. In terms of abundance, *Halophila ovalis* was the most dominant species followed *by Halodule pinifolia, Halophila beccarii, Halodule uninervis, Halophila ovata* and *Cymodocea serrrulata.* In the present study, the biomass productivity of all species was assessed, which was found to be influenced by seasonal variation in environmental and habitat parameters. Highest biomass yield was reported in Central sector in post-monsoon months and also in outer channel in both pre-monsoon and monsoon periods. The average biomass yield was highest (120.21±15.82 gm/m 2) in post- monsoon period and lowest (43.37±7.44 gm/m 2) during rainy season. However, the total chlorophyll content was maximum (0.8±0.06 mg/gm) in post-monsoon period, which varied in the range of 0.22±0.03 mg/gm to 0.8±0.06 mg/gm.

SRY-12: Population inventory, habitat distribution modelling, propogation and reintroduction of *Lasiococca comberi*

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Lasiococca comberi Haines (Euphorbiaceae), an endemic and threatened tree species occurs in the forests of Odisha and Andhra Pradesh of India and in Thailand. Because of existence of few dwindling populations and narrow geographical distribution in two Asian countries, the species has been listed as a threatened taxon by IUCN. Due to a number of biological bottlenecks such as disproportionate distribution of male and female flowers, poor seed viability and seedling establishment and human-induced impacts like habitat destruction, the wild populations of the species are rapidly declining. In view of its rarity and being a potential dietary source of omega-3 fatty acids, in situ conservation of this threatened species is urgently needed along with augmentation of natural populations through reintroduction. In the present study, the inventory of wild populations has been made through quantitative ecological study and presence of 3115 individuals of *L. comberi* in India belonging to various regeneration classes has been reported. Taking point distribution data, suitable prediction models for identification of potential habitats through Maximum Entropy (MaxEnt) distribution modeling algorithm has also been developed. Vegetative propagation method through air-layering has been thoroughly worked out with the application of root promoting substances to obtain large-sized mature planting materials for reintroduction to natural habitats. Treatment with indole-3-butyric acid (IBA) at 5000 mg/l concentration resulted highest rooting in air-layers (95.23%) of *L. comberi*. For recovery of this endangered species, a total of 1042 plants have been reintroduced in suitable forest habitats and the survival and growth of the reintroduced plants have been quite encouraging.

SRY-13: Study on some selected ethnomedicinal plants used by traditional healers of Kaprada forest (Valsad district), Gujarat, India

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The selected study area of Kaprada forest, Valsad district in Gujarat state. The study was aimed to document the traditional healer's knowledge of the local people about the uses of different plant parts through personal interview. The study was focus on identify medicinal plants, which parts of the plant is used, method of preparation, diseases treatment method. The data collected reveled that about 15 ethnomedicinal plant species belongings to 11 families were recorded to use of medicinal uses. The common diseases treated by the traditional healers like blood pressure, cancer, diabetes, dengue, fever, gynecological problem, heart diseases, joints pain, natural immunity power, sexual debility, skin diseases, tiredness.

Fr. Anthony Mukkath - K.S. Manilal Award

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FAM-KSM-1: Systematic position of *Saussurea* and its allied genera based on morphological and molecular data

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The genus *Saussurea* (tribe Cardueae, Asteraceae) includes approximately 498 species distributed in temperate areas of Asia, Europe, America and Australia. In India, the genus is represented by approximately 60 species. The taxonomy of the genus *Saussurea* is controversial. Establishment of new generic status for some of the infra-generic taxa makes it necessary to evaluate the systematic position of the members within the *Saussurea* group. Two members of the group, *Himalaiella* and *Lipschitziella* have always been taxonomically challenging to distinguish. When *Himalaiella* was recognized for the first time as an independent genus by Raab-Straube (2003), morphological and molecular data were used. However, the low sampling of taxonomically important species led to incorrect inferences about the relationship between *Himalaiella* and *Lipschitziella*. Previous phylogenetic studies have shown close relatedness between the two genera. Both the genera are perennial herbs and have various morphological characters in common. In the present work, we have tried to resolve the prevailing confusion between the two genera using molecular and morphological data. This is the first attempt to understand the phylogenetic relationship of the two genera. Around 170 sequences were subjected to phylogenetic analysis using nuclear and plastid DNA markers. Bayesian and Maximum likelihood approaches were employed. Our combined plastid and nuclear phylogeny help infer the systematic positions of the genera *Lipschitziella* and *Himalaiella*. The morphological similarities and differences between the two genera have been analyzed and discussed.

FAM-KSM-2: Molecular characterization of plants using DNA Barcoding:A Biotechnological and Bioinformatics Approach

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Plants dwelling at the base of biological food chain are of fundamental significance in providing solutions to some of the most daunting ecological and environmental problems faced by our planet. There are an estimated 3,00,000 plant species in the world but comparatively few of these can be identified by routinely used identification methods. DNA barcoding may be defined as the use of short nuclear or organelle DNA sequences for the identification of organisms. The entire study was designed based on the three major objectives- the first objective was generation of reference barcodes from selected plants of Rajkot, Gujarat and surrounding areas; the second objective was evaluation of efficiency of candidate barcode loci at various levels of plant taxonomical classification using the experimentally generated and Genebank retrieved sequences as well as the third objective was to test the applicability of DNA barcoding technique. In this study, a total of 359 reference barcodes were generated from 130 plants of Rajkot city and surrounding areas as well as 35 accessions of 2 *Vigna* species. While using different DNA barcode loci at different levels of taxonomical levels of classification, ITS/ITS2 was found to be a relatively efficient locus all the above mentioned levels. Moreover, the applicability of DNA barcoding was tested for the identification of herbal powder. Here a novel approach was used, where protein homology models of barcoding loci could aid in species identification. Hence, the entire study was based on evaluating the efficiency of candidate plant barcode loci and testing the applicability of DNA barcoding technique.

FAM-KSM-3: Biosystematics in the genus *Ledebouria* Roth (Hyacinthaceae: Hyacinthoideae) in India

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Ledebouria Roth has about 61 species and 2 infraspecific species in the world. (WCSP 2018). In India the genus represents with *Ledebouria revoluta* and other three ill-defined spp. viz. *L. viridis* S. Dutta &; P. Harvey ex M.R. Almeida, *L. karnatakensis* Punekar &*Lakshmin*., and *L. hyderabadensis* M.V. Ramana, Prasanna &; Venu. To solve the complexes in later three ill-defined spp, we have studied 25 populations of the genus *Ledebouria* in Indian context with the help of herbarium consultation, literature survey, field observations, ex-situ experiments, to understand

the morphology, cytology and molecular phylogeny. The karyotypic studies revealed different ploidy ranges from viz. 2n=30, 45, 60 and 90 while morphological studies explains different shapes, sizes and mottling pattern according to the populations. The data from the DNA sequencing with the trnL & matK markers have been used to support the cytological and morphological outcome, in result we conclude that a newly described *Ledebouria* spp. listed in the literature for India were misapplied and they are merely different as races, and therefore we propose new taxonomic synonyms.

FAM-KSM-4: Chemotaxonomy of the genus *Myristica* Gronov. (Myristicaceae) in the Western Ghats

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The genus *Myristica* Gronov.of Myristicaceae represents an important group of aromatic trees, widely distributed in the forests of the Western Ghats. It is represented by 3 species in the region; *Myristica beddomei*, *M. fatua* and *M. malabarica*, in addition to *M. fragrans*, widely cultivated and naturalised in the region. Chemosystematic studies based on secondary metabolite profile has proven as an efficient supportive tool for plant systematics and the present study reports the utility of volatile organic compounds in the leaves of *Myristica* species for chemosystematics, and to assess diversity in both intra- and inter-specific level. The leaf volatile chemicals were isolated by hydrodistillation and analysed through GC-MS. Sesquiterpenoids, derived from mevalonic acid pathway were the predominant volatile chemicals, followed by monoterpenoids derived from DOX pathway. E-Caryophyllene and α-humulene were the major compounds in *M. beddomei*, *M. malabarica* and *M. fatua* while β-pinene, sabinene and α-pinene were the major constituents in all the accessions of *M. fragrans*. The species were sub- grouped into

different clads in dendrogram using SPSS software, based on the leaf volatile chemical distribution. Dendrogram shows *M. beddomei* and *M. malabarica* are closely allied whereas *M. fragrans* is the only species distantly related. Intraspecific diversity was also evaluated with respect to the chemical constitution of leaf volatiles from different accessions of a species, with some sort of morphological variation. The leaves of different accessions of *M. fragrans* with yellow and red aril showed the same distribution pattern of volatile organic compounds, with β-pinene, sabinene, α-pinene and limonene as the major compounds. The relationships found in the present study provide insights to the phylogeny of the species and also highlight the importance of a multidisciplinary data analysis to elucidate more robust species relationships.

FAM-KSM-5: Taxonomic identity of *Sonerila axillaris* (Melastomatatceae): supplemented with morphological, anatomical and micromorphological data

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The genus *Sonerila* Roxb., principally an Asiatic genus of the family Melastomataceae (tribe Sonerileae), consists of about 180 taxa worldwide. It is distributed in Indo-Pacific regions and a complete checklist of this genus is yet to realize. The members are caulescent/acaulescent herbs of shady habitat often with basal rosettes of large, turgescent leaves, sometimes with tubers and mostly seen in moist rocky crevices. Clarke (1879) reported 43 species in Hooker's Flora of British India, of which 22 belongs to the present political boundary of India. Fifty eight species and two varieties are so far reported from India. The highest diversity is found in Western Ghats with forty nine species and two varieties having sizeable percentage of endemism (ca. 76 %). Wight (1946) established two species from Nilgiris viz., *S. versicolor* and *S. axillaris*, endemic to Kerala and Tamil Nadu. The latter was treated as a synonym of the former by Clarke (1879) or as a variety of the former by various authors (Gamble, 1915; Ramachandran & Nair, 1988; Sabu et al., 1988; Vajravelu, 1990; Sasidharan & Sivarajan, 1996; Saldhanha, 1996; Nayar et al., 2014). However, the consultation of different herbaria, collection of live specimens as well as detailed studies of morphology, anatomy and micromorphology

of pollen, seed and trichomesproved that *S. axillaris* is quite distinct and hence its species status is reinstated here. The present work highlighted the taxonomic scenario of *S. versicolor* and *S. axillaris* with a special emphasis to the morphological, anatomical and micromorphological data.

FAM-KSM-6:Diversity of secondary phloem in some species of *Merremia*Dennst. *ex* Endl.(Convolvulaceae)occurring in Gujarat state

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Development of regular and variant phloem in eight species of *Merremia* (Convolvulaceae) is investigated by light microscopy. Formation of variant secondary phloem was produced in four ways: i) from successive cambia (in *M. dissecta, M. hederacea, M. quinquefolia* and *M. vitaefolia*), ii) from internal cambium (in all the species) that initiate at the pith margin, iii) unlignified parenchymatous xylem (UPX) in *M. hederacea, M. quinquefolia, M. umbellata* and *M. vitaefolia* and iv) irregularly distributed parenchymatous islands distributed in the secondary xylem in *M. hederacea* and *M. vitaefolia.* In rest of the species parenchyma islands were either absent or they do not form interxylary phloem. In thick stems, quantifiable amount of intraxylary secondary phloem was accumulated due to the activity of internal cambium. Structure and dimensions of the sieve tube elements varies in all three different types (regular external, inter- and intraxylary) of phloem. Occurrence of wide and narrow sieve elements within the same species may be having ecological or functional significance Further studies are recommended on species that show presence of wide and narrow sieve elements, which may contribute in understating the functional ecology and evolution of climbing habit.

Prof. M. Sabu Award

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MS-1: Angiosperm diversity in Barail Wildlife Sanctuary, Assam with a note on rare, endangered & threatened (RET) taxa

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Barail Wildlife Sanctuary (BWS), situated in the lap of North Cachar and Barail hill ranges in southern part of Assam, is a Nature's paradise with bountiful wealth of flora and fauna. Blessed with remoteness, distinctive topography and high precipitation, the sanctuary has become a home of enormous plant species including a good number of endemic and rare, endangered and threatened (RET) taxa. BWS was a *terra incognita* in terms of its angiosperm diversity before the initiation of this study. An attempt was, therefore, made to document the angiospermic plants in the sanctuary based upon conventional morpho-taxonomic studies done during 2012 to 2018. Lying between 24°58′ – 25°5′ North latitudes and 92°46′ – 92°52′ East longitudes, the sanctuary covers a geographical area of 326.24 sq. km. Repeated and periodic field visits were made in different eco-regions of the sanctuary to survey and collect plant specimens from their habitat and to examine and record their external morphology, range of variation, habitat preferences, ecology and associated plants, wherever feasible. A total of 720 species (with two subspecies and ten varieties) distributed under 494 genera and 132 families were recorded from the sanctuary during the present research. Taxonomic and taxic diversity were also calculated which showed high level of monotypism in floral elements (angiosperms) in BWS. Ten taxa endemic to northeastern region were recorded from the sanctuary. Of the total enumerated species, one endangered, nine vulnerable and 65 least concern species were found to occur in the sanctuary as per IUCN red list category. Those species should be prioritized for conservation. As an outcome, a user-friendly comprehensive identification manual of angiosperms in BWS has been generated.

MS-2:Systematics of the genus *Solanum* L. (Solanaceae) in Eastern Ghats of India

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Solanum L is economically and medicinally important genus and one of the largest genera of flowering plants with c. 1500 species distributed in all continents except Antarctica. In India, the genus is represented by 48 species of which 19 species are reported from Eastern Ghats. During revisionary studies of the genus in Eastern Ghats, 23 species of *Solanum* L. have been collected, identified and studied. Morphological data were used to make-pair wise comparison of the characters based on shared and unique amplification products to generate a similarity matrix. The similarity value of 23 taxa based on simple matching coefficient from the matrix of 97 characters was determined. OTUs codes were used and dendrograms obtained from Nei and Li (1979) method showed the relationship of all *Solanum* species taken in the present revisionary studies. As per dendrogram, All species group into two major cluster at a level of 69% similarity. In addition the genus *Lycianthes* (Dunal) Hassl. and the species *Solanum villosum* Mill., *S. elaeagnifolium* Cav., *S. diphyllum* L. &*S. pseudocapsicum* L. are reported here as a new generic and species records for the Eastern Ghats of India. A new variety *Solanum americanum* var *odishense* Kalidass C., Murugan P. & P.C. Panda, from Eastern Ghats, India has also been described.

MS-3: Medicinal and desert-Life- support properties of *Opuntiaelatior* Mill.fruits

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The human life depends on the life supporting plants. It has now become a concern of the modern world to preserve and gather all information and utility about all these plants. The desert, is a unique ecosystem having limited available plants resources. *Opuntiaelatior* Mill. (Cactaceae) is locally known as *findala*(Gujarati). The present study deals with the evaluation of medicinal and life supporting properties of *Opuntiaelatior*fruit extracts. The different solvents (Methanol, Hexane and Distilled water) were used for fruit extraction using soxhlet extraction method. The methanolic extract showed the maximum extractable yield. The nutrition present per gram of methanolic extracts of fruit contain carbohydrates (0.102mg), protein (0.060mg), vitamin C (6.32mg) and fat (0.011mg) are present. Anti-oxidant activity exhibited by the hexanolic, distilled water and methanolic extract was 45.66%, 50.40% and

54.10% respectively. The anti-inflammatory activity was studied using inhibition of protein denaturation method. Denaturation of proteins is responsible for the cause of inflammation and it leads to the conditions like rheumatoid arthritis, diabetes and cancer. Prevention of protein denaturation may also help in preventing inflammatory conditions. The magnitude of anti-inflammatory activity was exhibited by the hexanolic, distilled water and methanolic extract at the 30.38%, 34.15% and 37.49% respectively compared to Diclofenac, a standard anti-inflammatory drug that showed the maximum inhibition of 63.33%.Methanolic extract has alkaloids and phytosterols compound. HPLC and GC-MS analysis of methanolic extracts was carried out for characterization of bioactive compounds. In the present study it is seen that the *Opuntia*fruit was rich in nutrients and antioxidant and anti-inflammatory properties.

MS-4:Urban Development forecast, effect on land use, biodiversity and conservation in Mulshi: A Part of Northern Western Ghats (NWG)

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Natural resources are under extreme pressure due to the mushrooming human population and rapid urbanisation across the world. Mulshi tehsil is located in Northern Western Ghats (NWG) at 18°25'N to 18° 41' N and 73°20' E to 73°25' E. which covers 240 sq. km area from Pune district, Maharashtra. Physiography and climate of NWG support Tropical semi evergreen to moist deciduous type of forest vegetation with immense global significance for conservation of biodiversity. In last one and half decade two hill cities like Lavasa and Aamby Valley are developed in Mulshi. Recently permission has been granted for one more new lakeside hill township by state environment authority with environmental clearances. The State Environment Impact Assessment Authority (SEIAA) gave clearance for land and infrastructure development for this new hill station, which will cover 5,914 acres of area. The villages covered in this hill city were Barpe, Bhamburds, Adgaon, Ghutke, Saltar, Ekole and Majgaon. The project is proposed by the Mumbai-based Maharashtra Valley View Pvt Ltd (MVVPL). The total geographical area of these villages is 4158.68 ha and forest cover is 2280.37 ha. with rich endemic flora. Besides seven sacred groves with reserved forest pockets are reported during study. Due to this upcoming hill city the biodiversity will be seriously affected and it needs to be conserved. Open uncontrolled urbanization accompanied by the destruction of natural ecosystems and unfortunately results in the loss of native species in the

region. Such action alters fragile ecosystems and reduces or destroys the natural resource base. Considering the ecological significance of the area where these hill cities are located, the study recommends undertaking detailed investigation of the urbanization trends of these cities, and an assessment of their ecological footprint. Indeed, the study argues from the conservation perspective, as it is important for urban planning to take into account the impact of urbanization on biodiversity, natural resources, quality of life, and ecosystem services for sustainable urban in Mulshi tehsil.

MS-5: Floristic diversity of Gujarat State

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The State of Gujarat is situated on the western coast of the country. It lies between 20°07´ to 24°43´ N and 68°10´ to 74°28´ E. The total geographical area of the state is 1,96,022 km^2 which constitutes 5.96 percent of the country's geographical area. Gujarat state has a range of natural habitats such as the dry saline Rann of Kachchh, Grasslands, rivers, wetlands, coastal area with mangroves and coral reefs, thorn forests, dry deciduous and moist deciduous forests. These in turn, have contributed to a rich diversity of ecosystems and species in the state. The wide variations in climate and topography have resulted in various forest types spread over 14,653 km^2. The present work deals with 2386 taxa under 932 genera and 163 families of flowering plants. There are 192 endemics and 61 threatened species. Besides this, Gujarat state is also enriched in economic plant resources and many of them have potentiality to add to the economy of the state. Due to anthropogenic pressure there is a huge pressure on forest land and biodiversity. Such as indiscriminate cutting, excessive biotic interferences, invasion of alien species, over grazing, tourism, loss of pollinators, seed germination capability, ecological competition, pathological causes, change of environmental factors etc. are the causes of loss of biodiversity. The developmental activities, viz. construction of roads, railway lines, bridges, dams and mining activities are very much responsible for habitat destruction. Further, the germplasm of depleting plant resources to be preserved in seed banks and habitats may be protected to promote *in-situ* conservation.

MS-6:Insights into the phylogeny, biogeography and character evolution of the lamioidmint genus *Leucas*

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Leucas R.Br. *s.l.* is one of the largest genera in the subfamily Lamioideae of the family Lamiaceae. It is widely distributed from tropical to southern Africa, tropical and sub-tropical parts of Asia and Australia with almost 100 species. *Leucass.str* identified as an Asian taxa shows highest number of species richness. About 45 species of *Leucas* are found in India and most of them are found to be endemic to Western Ghats. Western Ghats has been served as refugia in the late cretaceous period at the time of volcanic eruption. The specimens of *Leucas* collected from different localities of India; especially from Western Ghats were amplified using three chloroplast regions (*trnL* intron, *trnL-F* intergenic spacer, and *rps16* introns). We performed a phylogenetic analysis of*Leucas* with a broad taxon sampling (40 of 45 species)using Bayesian approach. We aimed at identifying monophyly in Asian *Leucas*, their putative morphological synapomorphies, their geographical distribution, biogeographic origin using BEAST and BEAUTi softwares and character evolution using Mesquite.Monophylly of Asian *Leucas* has been proved. Molecular dating was performed using 6 Lamiacean plant fossils. We were able to resolve the phylogeny at its sectional level and also identified divergence date of each clade in million years ago too.

MS-7: Phytochemistry of white, yellow and pink flowered variants of *Aerva lanata*

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Certain populations of *Aerva lanata* showed development of yellow and pink coloured flowers, apart from the regular white flowered variant. White and yellow flowered variants of the plant were analysed for various classes of compounds in

order to study the extent and cause of variation between them. Free phenolics were extracted using cold extraction in methanol, while bound phenolics were extracted by mild alkaline extraction, using Na_2CO_3 solution. Total Phenolic Content assayed using Folin-Ciocalteau method showed similarity in phenolic content. Methoxy kaempferol has been identified for the first time in the flowers of the plant. Flavonoid content was higher in the yellow variant, especially when subjected to mild alkaline extraction. Phenolic acids identified were similar except that melilotic acid was found only in the yellow variant. White variant showed very high chlorophyll content as compared to the yellow counterpart. HPLC fingerprint comparison of the methanolic extracts revealed phytochemical variation in the two samples. Difference in dimensions of leaf and flowers were also conducted. Pink flowered variant was rare. The pink betacyanin pigment was extracted and subjected tospectral characterization using FTIRspectroscopy and HPLC/MS/MS technique. The HPLC analysis was performed on a reverse phase column andthe pigment was ionized using APCI technique. Analysis confirmed that the betacyanin pigment was Betanin, the pigment also responsible for the deep colour in beetroots.

MS-8:RET plant diversity on the grassland foot hills of southern coastal area, Western Ghats

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Monsoon seasonal flora on grasslands shows varied diversity as per geographical conditions. A detailed field work was conducted to understand the variation of species diversity on different locations. Over the period of ten years case study it was clear to the researcher that how species diversity in each plateau varies according to geography. Out of 30 study locations in coastal area of Karnataka, Uttarakannada and dakshina kannada plateaus and in Kerala Madayippara Plateau showed highest endemic plant diversity. Recent plant explorations revealed some more new species of angiosperms ie *Blyxa mangalensis* Rashmi and Krishnakumar and *Eriocaulon gopalakrishnanum* Rashmi and Krishnakumar etc. Also from the laterite hills of study region 37 endemic grasses are reported from this kind of locality. Out of 220 species known from the study localities, 58 are Peninsular Indian endemics; of which 25 are narrow endemics of Kerala and Karnataka, confined to the laterite hillocks. 10 species are Indian endemics and 31 species are known from confined to Peninsular Indian and Sri Lanka and 12 species to Indian region and Sri Lanka. Abundance of

species varied according to temperature and rain fall fluctuations. Increased anthropogenic activities like quarrying, land conversions are threat to this neglected ecosystem.

MS-9: Phenological Cycle is influenced by Climatic variables in Girnar Reserve Forest, Gujarat, India

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Phenology is time of recurring phenomena such as new foliage, leaf fall, flowering and fruiting, which provides clear vision for ongoing changes at species and community level. Studying phenology in the natural forest is of vital use because it is directly related with genetic resources of local area which are important for any country's economy. A phenological study was carried out on 63 tree species of Girnar Reserve Forest, a National Sanctuary, Junagadh, India during August 2008 to 2011 for three years respectively. New foliage was found highest during August to September (45.5% for both months) whereas leaf fall showed its peak in January with 62% species. Reproductive phenotyping occurred during February to June in most of the trees. Flowering was dominantly seen in February with 57.14% for approximate species, however, on the other hand, fruiting was dominated in April month with 62.96% species. Mean new foliage phenophase was 78.68 ± 13.46 days whereas leaf fall duration was 74.13 ± 13.86 days. Flowering duration was 75.33 ± 10.99 numbers of days and in fruiting, GRF exhibited duration of 87.79 ± 13.36. Mean leaf fall duration possessed negative correlation with minimum temperature (-0.84**, 0.84**, 0.80**) for respective years 2088-09, 2009-10 and 2010-11 similarly, mean flowering duration was also associated negatively with minimum temperature for all three years (-0.71**, -0.67**, -0.60**) in Girnar Reserve Forest. Wind speed also affected leaf fall duration with positive significant correlation for, first (0.05**) and last year (0.04**). It is clear that phenological cycles and characters are affected by local climate against which all the species were adapted by presenting certain phenological behaviour, and study of which makes much sense. Current study can be useful in social forestry as well as different fields of plant sciences and biodiversity conservation issues.

Theme 1: Systematics and Phylogeny of Flowering plants

O-T_1-11	Lectotypifications in *Dicliptera* (Acanthaceae) and a note on rediscovery and legitimacy of *D. leonotis*	**Sharad Kambale,** Shruti Kasana, K. V. C. Gosavi, Sanjay Gajanan Auti & Karan Rana	**61**
O-T_1-12	Molecular Genetic Diversity and Phylogeny in the Genus *Passiflora* L. (Passifloraceae)	**Beena V. L.**& S. Suhara Beevy	**62**

O-T_1-1: An appraisal of Genus *Codonopsis* Wall (Campanulaceae) in India

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Codonopsis Wall. (Campanulaceae) is a perennials herbaceous genus native to Indo-China and Eastern Asia. The genus with 55 species is mainly distributed in Afghanistan, Pakistan, Himalayas (Bhutan, Nepal and Sikkim), Southern China, Taiwan and Japan. Members of the genus are characterized by solitary and large campanulate flowers; most of the members of the genus have a peculiar foetid odour. Based on the pollen morphology and foetid odour of the plants, the genus is assigned in to three sections. Some of the species of the genus have medicinal properties and used in Chinese and Korean traditional health care systems. C.B.Clarke (1881) reported 10 species of *Codonopsis* Wall. under two section *Campanulamoea* and *Cyclocodon*from British India while Haridasan& Mukherjee reported 13 species of *Codonopsis* Wall. from India. Recent field studies in the Himalaya, established occurrence 17 species in India. Out of 17 species *Codonopsisovata, C. clematidea, and C. rotundifolia*are shows an extended range of distribution in western Himalaya, while the rest of the 14 species are restricted in eastern Himalaya.*C. rotondifolia*Benth is the distributed in the entire Himalaya. The present communication deals with the detailed taxonomic account all species of genus *Codonopsis* in India with special emphasis on the morphology, diversity and distribution with updated nomenclature. The population study of few species from Arunachal Pradesh are also discussed elaborately. A key to Indian taxa of *Codonopsis*has also been provided.

O-T_1-2: Preliminary observation on *Leea* L. (Vitaceae) in India

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The genus *Leea* L. is relatively a small group, comprising about 34 species worldwide. The genus was originally placed in the family Ampelideae, but was transferred to Leeaceae and then more recently to the family Vitaceae. It is found

entirely in the Old World tropics, ranging from tropical Africa to Asia and Polynesia. Clarke (1881) in his Revision of Indian species of *Leea* recorded 10 species under three sections (Sect. Edgeworthiae, Sect. Laetae and Sect.Rubrae) based on the pinnationofleaves.J. D. Hooker (1896) reported 15 species in *Flora of British India*, but most of the species are synonymized by subsequent workers. Gamble (1919) included 10 species in *Flora of Presidency of Madras*.B. D. Naithani recorded 11 species from India. In 2001 one more taxa is added from Andaman by Krishankumar. Altogether in India it is represented by 13 species. The present study based on live collections of *Leea* from all over India provides a detailed illustrated taxonomic account updating their nomenclature. It also provides an account on their distributional pattern and habitat requirement.

O-T$_1$-3: Taxonomic revision of the genus *Haplanthodes* O. Kuntze (Acanthaceae)

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The genus *Haplanthodes* O. Kuntze belongs to the family AcanthaceaeJuss. *Haplanthodes* comprises 04 species, *viz.Haplanthodesneilgherryensis* (Wight) R.B. Mujumdar, *H. plumosa* (T.Anderson) Panigrahi&G.C. Das, *H. tentaculata*(L.) R.B. Mujumdar and *H. verticillata* (Roxb.) R.B. Mujumdar. The species have been recorded from the states Goa, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu. They occupy shady places along the road sides or grow under forest cover. In the present communication we discuss the taxonomy, palynology and seed morphology of the genus. Pollen grains were single, oblate, prolatesphaeroidal,polar outline distinctly triangular, trizonocolporate, exinetectate, reticulate. Seeds were small, browny, hygroscopic hairy and compressed.

O-T$_1$-4: Resolving Taxonomic Problems in Genus *Ceropegia* L. with Vegetative Micromorphology

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Genus*Ceropegia* L. of Family Apocynaceae, Subfamily Asclepiadoidae comprises many narrow endemic and threatened species distributed only in tropical and sub-tropical regions especially, Africa, India, Australia and neighbouring region. It comprises 213 accepted species and 8 unplaced & 36 un-assessed taxa of species and infra-specific ranks. Most of the taxa are endemic to the regions or locations from where they are described. In India, it is represented by about 66 taxa comprising of 59 species, 2 subspecies and 5 varieties, comprising of 40 species and six varieties endemic to India.

In general, all these taxa are described on the basis of floral morphology as the allied taxa have many similarities in vegetative characters. Vegetative micro-morphology is being neglected. So, there is need of disclosure of micro-morphological as well as anatomical characters that would be helpful in identification of taxa in vegetative state. Therefore, a study was undertaken on total 26 taxa from North Western Ghats, India to reveal micro-morphological characters. The study resulted into development of identification key on the basis of vegetative characters and also the phylogenetic tree was established to show the inter-relationships among the taxa.

O-T_1-5: Preliminary observations on the Distribution and Diversity of the Genus *Blumea* DC. (Asteraceae) in Peninsular India

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The genus *Blumea* DC.is one of the largest in the Inuleae-Inulinae, comprising approximately 100 species distributed throughout the Old World tropics, with the highest diversity in tropical Asia and a few species in Australia and Africa. The genus *Blumea* is named in honour of C. L. Blume, the celebrated Dutch botanist and the author of many works on the East Indian flora. Many members of *Blumea* are widespread weeds common in disturbed areas, but some species also play an important role in undisturbed, open vegetation types, and there are several examples of geographically and ecologically restricted species. Of the 41 species present in India, most of the species is confined to Peninsular India. A total of 32 species and 13 intraspecific categories are present in Peninsular India. Of this, 3 species are endemic to this region. The characters of the genus is highly variable and overlapping. *B.lacera, B. hieracifolia, B. lanceolaria, B. membranaceae, B.axillaris*are some of the highly variable species. Previous workers have suggested some reason for the

high variability of this species. In a previous revision of this genus by Randeria, utilized some of the anatomical features in the separation of very closely related entities and she agrees completely with the previous workers that these plants need a careful study under cultivation.

O-T_1-6: Petiole anatomy of some *Bauhinia* species occurring in Gujarat: as alternative option for species level identification

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Petiole is one of the important part of the leaf that connects leaf lamina with main stem or branch. Beside its pivotal role in transport of photosynthate, minerals and nutrients, anatomy of its vasculature is extensively utilised in plant systematics for the identification of taxon at species level. In this connection, eleven species of *Bauhinia* are investigated in the present study, which showed that cortical bundles were present in *B. tomentosa*, *B. variegata*, *B. acuminata*, *B. malabarica*, *B. phoenicea* and *B. purpurea.* Petioles of other species like *Bauhinia foveolata*, *B.malabarica* and *B. vahlii* showed two rings of xylem rings, in contrast, B. guanensis showed irregular arrangement of vascular bundles which get arranged in the form of ring in fully grown/defoliating leaves. Occurrence of cortical bundles in petiole cortex and double ring of secondary xylem can be successfully utilized for the species level identification of ten species of *Bauhinia* occurring in Gujarat state. Structural details of secondary xylem, phloem and cortical bundles is described and correlated with their functional significance. Diagnostic key on the basis of anatomical features is also provided herewith.

O-T_1-7: Synopsis of the genus *Ziziphus* Mill. (Rhamnaceae) for India

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*Ziziphus*Mill. (Rhamnaceae) is one of the economically important genera due to its edible nature. The genus consists of *c*. 65 species mainly distributed in temperate and

tropical parts of the world, chiefly in Asia and America, few extending to the pacific Island and Australia. In India, the genus is represented by 17 species and 10 varieties. However, literature survey revealed that *Ziziphushorsfieldii*Miq. from Andaman and Nicobar Island and *Ziziphushysudricus* (Edge.) Hole from Jodhpur and Punjab are the two species which need to be added in the list of Indian *Ziziphus*.

O-T_1-8: Taxonomy of the *Boerhaviarepens* (Nyctaginaceae) Complex in India

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The studies were carried out to revise taxonomic complexity of *Boerhaviadiffusa*in India. As a conclusion the species are reinstated as *Boerhaviarepens*, *B. procumbens* and treated as distinct species from *B. diffusa*.

O-T_1-9: Revisionary and cytotaxonomic studies on the geophytic and succulent species of *Euphorbia* L. from India

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The genus *Euphorbia* L. (Euphorbiaceae) comprises c. 2046 species (The Plant List, 2013), and is probably the largest angiosperm genus, (Mabberley, 2005). In India, the genus is represented by about 86 species, with an addition of *E. vanketraji*, *E. belgavien is*,*Euphorbiagokakensis*Yadav, Malpure&Chandore and *E. kadapensis*Sarojinidevi&Venkataraju, of which 20 species belong to subgenus *Euphorbia*. It is the largest genus of the family in India with 31 endemic species (Binojkumar&Balakrishnan 2010). The subgenus *Euphorbia* is characterized by its succulent, cactiform and always fleshy, caducous leaves. In India, there are 24 species, including newly added, and one variety of the geophytic and succulent spurges. The genus was worked by many of the authors in their floras, lot of literature has been published including the revision of *Euphorbia* but it needs revision and critical analysis along with cytological and taxonomical studies for circumscription

of the species, as all fails in delimiting the various forms and populations to the species level. In India, only 3 taxa of *Euphorbia* are geophytic but still the status is unclear and needs collection of populations to solve the problem. With this backdrop in mind collection of various populations from 16 different locations were carried out, populations were identified with the help of protologues and were assigned to 14 known species of *Euphorbia*. Cytological and taxonomic studies on two populations collected from Maharashtra are underway to confirm the identity.

O-T_1-10: Morphological Diversity of Pappus in Some Taxa of Asteraceae

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The Asteraceae or Compositae are regarded as a fairly advanced family of the dicotyledons (e.g.,Cronquist, 1988; Takhtajan, 1997). The classifications by Bentham (1873a, 1873b), Hoffmann (1890) and others have considered pappus as important character in subfamilial, tribal and infratribal classification.

The pappus is a classical source of taxonomic information at the generic and specific level but less at the higher levels. It is oriented either in one or more rows but the mode of arrangement of pappus is more or less constant for each species. Present study deals with the morphological variations of pappus of 141 species belonging to 80 genera under 14 tribes. The number of studied species in each tribe is indicated in parentheses: Inuleae (26), Calenduleae (2), Astereae (13), Anthemideae (8) , Senecioneae (19) ,Heliantheae (14) , Eupatorieae (7) , Mutisieae (l), Dicomeae (l), Pertyeae (2), Cardueae (12), Lactuceae (15), Vernonieae (18), and Arctoteae (3).

Pappus structures can be divided into five categories with the pappus elements consisting of l) scales, 2) bristles, 3) crowns, or coronas, 4) setae, and 5) awns. Combinations of and modifications within the groups occur in the family, e.g., bristles may be smooth, barbellate or plumose. In the taxa studied, pappus bristle is the most prevalent type. Pappus may be homomorphic or heteromorphic; either ananged in one, two or three rows, either persistent or caducous. Sometimes the apical part of the pappus is especially significant for distinction of taxa (e.g., *Sonchus* spp.) or the-basal part of the pappus is different in ray and disc cypsela (e.g., *Hypochaerisglabra*). Vascular traces are not usually visible within the pappus structure, but are noted in *Arctotis* and' *Catananche*. Pappus elements may be five, few or numerous in number and usually without having any vascular tissue. In true

sense, pappus is absent in the tribe Calenduleae and some isolated genera in different tribes. Pappus bristles again can be divided into four categories, viz. capillary barbellate, scabrous barbellate, plumose and subplumose. Among them scabrous barbellate type of bristles are more prevalent in major tribes. Pappus bristles are absent in Anthemideae and Heliantheae. Scales and awns are restricted in Heliantheae and Inuleae. Coronate or border like pappus is found in some Anthemideae and some Inuleae. Extremely rare case, pappus is constituted by "Twin hair" like scales as seen in *Brachycome* or pappus form a tube like structure in *Helipterum floribundum.* It may be conspicuously heteromorphic in different tires of same species. The role of pappus structure in different tribes has been discussed on the view point of evolutionary aspect. A table is presented for different taxa to elucidate its diversity of pappus structure in some tribes of the Asteraceae. The structures of pappus in different taxa have been studied critically with the help of both light microscope and SEM.

There are two views regarding the morphological nature of pappus. Initially, a non-calycine nature of pappus was advocated by Small (1919). This view was partially adopted by Sattler (1973), but has not been generally accepted by recent workers. The almost universally accepted view is that the pappus is calycine in nature, i.e., a modified calyx. This idea was introduced many years ago by Lund (1872) and later it was taken up and confirmed by a number of workers, e.g., Philipson (1953); Carlquist (1957); Ramiah&Sayeeduddin (1958); Tiagi& Singh (1975); Cronquist (l955.1977, I98l), etc.

The role of pappus structure in the evolutionary context is briefly discussed. A table based on the present survey presents the exomorphic variation of pappus and its possible evolutionary pathways.

O-T_1-11: Lectotypifications in *Dicliptera* (Acanthaceae) and a note on rediscovery and legitimacy of *D. leonotis*

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Genus *Diclipter*aJuss. (Acanthaceae) is represented by 150 species in tropical & warm areas of the world. In India, 21 species and nine varieties have been reported of which eight species occur in Maharashtra. It is the genus with ornamental value.
While surveying the Anjaneri hills in Nashik district of Maharashtra, authors collected an interesting *Diclipter*aspecies. After perusal of relevant literature and type specimen housed at K, it has been confirmed as *Diclipteraleonotis*Dalzell ex C.B.Clarke. It is evident that *D. leonotis* is an endemic species of Northern Western Ghats of Maharashtra and has never been collected after its type. It has been collected from the type locality after a gap of more than 140 years. While searching for the types of the names *Diclipteraburmanni* and *D. leonotis* it is found that the names are not typified. These names have been typified following Shenzhen Code and a note on the legitimacy of *D. leonotis* is provided.

O-T_1-12: Molecular Genetic Diversity and Phylogeny in the Genus Passiflora L. (Passifloraceae)

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Passiflora L. belongs to the family Passifloraceae are extensively grown in tropical and subtropical regions of the world. The genus consists of 521 species and most of them are distributed throughout the world except Arctic and Antarctic region. The genus is distinguished by herbaceous or woody climbers with axillary tendrils, attractive corona, and androgynophore. The species of Passiflora have been cultivated for their edible fruits, ornamental flowers and for pharmaceutical use. The wide range of variations exhibited by the genus at the inter and intra specific levels were reported. However, these phonetic variations were not yet estimated at the molecular studies. The present investigation assessed the inter and intra specific diversity by molecular markes and suggested the phylogeny of the species. Seventy accessions under 7species, 4 varieties, and 1 cultivar of Passiflora belongs to four subgenera viz, Granadilla, Dysosmia, Decaloba and Tacsonia, were analyzed to find out the relationships. Molecular analysis of 70 accessions by RAPD markers and ITS analysis of 11 wild and cultivated species showed inter and intra specific diversity. Out of 23 RAPD primers, five primers scored a total of 1578 reproducible bands with 97.2% polymorphism. Intra specific genetic diversity can be assessed from the

polymorphic bands observed in each accession. Maximum genetic distance was observed in *P.edulis* cv. Panamared) and minimum in the accessions of the subgenus Tacsonia (*P.tripartitia*). The UPGMA dendrogram and PCoA scatter plot revealed not only the inter and intra specific relationships but also the subgeneric relationships too. The ITS analysis revealed sequence variations from 611bp to 673bp in the wild and cultivated species of *Passiflora*. The sequences are published in the NCBI data bank.. High GC content (62.4%) in the subgenus Granadilla can be considered as the evolved nature compared to other subgenera (Decaloba, Tacsonis and Dysosmia). The high level polymorphism observed in the phylogenetic tree based on Neighbor Joining method helped to distinguish the genotypes. Variations in the length of the branchlets and the position of taxa in the phylogenetic tree exhibited their genetic relatedness and evolutionary distance. The Maximum parsimony and Maximum likelyhood analysis showed that all the species are evolved from a common ancestor, *P.leschenaultii*. The study also revealed that the species under investigation are descendants of *P.leschenaultii*.

Theme 2: Modern trends and techniques in Angiosperm Systematics

O – T_2 -8	Simultaneous identification and quantification of coumarin, precocene, β-caryophyllene oxide, humulene and β-caryophyllene in extract of *Ageratum conyzoides* by reverse phase high performance liquid chromatography-photodiode array (RP-HPLC-PDA) method	Tushar Dhanani, **Sonu Sharma**, Sonal Shah, Raghuraj Singh, S. Ghosh, N. A. Gajbhiye, Satyanshu Kumar	**72**
O – T_2 -9	Ethyl Methane Sulphonate Induced Chlorophyll Mutations in *Cyamopsis tetragonoloba* (L.)Taub.	**Bhosle S.S**. & Priyanka Ingle	**73**
O – T_2 -10	Comparative Assessment of Genetic Diversity Using Floral Traits through D2 Statistics and Molecular Markers in Diverse Species of Tomato	**Monika A. Makwana** and Akarsh Parihar[2]	**74**
O – T_2-11	Evaluation of Leaf Shape in Plant Systematics Using Morphometric and Technological Approach	**Kavi Oza,** Vinay M. Raole and Rinku J. Desai	**75**
O – T_2 -12	Diversity of intraxylary phloem in selected members of family Convolvulaceae	**Dhara G. Ramoliya**, Amit D. Gondaliya & Kishore S. Rajput	**76**

O–T_2 -1: Distribution studies of *Cordiadentata Poir*.with the help of morphology and molecular markers

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Cordia L. (Boraginaceae tribe Cordioideae) 250 - 300 species in trop. 16 in India, 9 in Maharashtra. The genus is represented by *Cordia dichotoma*, *C. macleodii*, *C. monoica* which are natural in this habitat. Whereas the exotic varieties like *C. sebestena*, *C. domestica*, *C. sinensis*, *C. dentata*, *C.subcordata* are also found in abundant. These species have aclamatised themselves in this habitat as if it's their natural habitat. *Cordia dentata* is a species from Caribbean region. There are only two individuals of this species in Mumbai and literature survey shows no records of this species from Maharashtra and other parts of the country. Our further literature survey tells us that this species is not recorded in any other state too. Two individuals from Mumbai (Victoria Garden and Mahalaxmi) have been misidentified by previous authors. Flora of Maharashtra by Almeida identifies it as *C. sinensis*. The major difference between these two species is that *Cordia sinensis* is dioecious plant whereas *C. dentata* is monoecious plant. Apart from the detailed morphological description molecular data was also studied. DNA markers used for the study are matK, ITS, trnl - f, rbCl.

O–T_2 -2: DNA Bar-coding: A sophisticate methods for authentication and identification of Medicinal plants

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The demand of herbal medicines is rising day by day due to presence of active bio-molecules which are directly or indirectly involved with high efficacy. It is going to be necessary to construct database for authentic identification of plants and their possible adulterants. Data-base can be coupled with DNA barcode for similarity

search. There are several molecular methods which have been implicated to develop markers that lead to authentication and proper identification of medicinal plants. In this lecture to discuss different genomic regions and molecular technique that provide barcode, available databases and the efficient future of DNA bar-coding and it is highly effective, economically-feasible and accurate detection methods concerning.

O–T_2 -3: Ultrastructural study on the formation of sclereids in two aquatic taxa *Nymphoides hydrophylla* (Lour) Kuntze. and*Nymphaea nouchali* Burm. f. (family-Nymphaeceae)

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The formation of star shaped sclereids in the *Nymphoides hydrophylla* and *Nymphaea nouchali* was studied microscopically. The sclereids of both species developed incessantly from the fundamental parenchyma. The outer surface of mature sclereids was smooth in Nymphoides, but with many prismatic crystals in Nymphaea were observed. The crystal formation in young sclereids of *N. nouchali* started near the renunciation of sclereid expansion. Calcium antimonate precipitates were found, especially on the crystal sheath. In *N. hydrophylla* prominent branch was present in the terminal portion of each sclereid, where in *N. nouchali* has no specific branch was present.

O–T_2 -4: Karyological and palynological studies on a monotypic woody climber *Zanoniaindica* (Cucurbitaceae)

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Family cucurbitaceae Juss.is an economically important family. It is well-known as gourd family. Family comprises 2600 species and 109 or 110 genera, divided into 15

tribes. In India, a total of 94 species have been recognized across 31 genera. *Zanonia* L. is a monotypic dioecious woody climber of tribe Zanonieae Benth. & Hook.f. The only species *Zanonia indica* L. is distributed from India, throughout Southeast Asia to New Guinea. Chromosome data are not available for the entire tribe Zanonieae. This paper presents first cytogenetical analysis of a monotypic genus, *Zanonia indica*. The diploid chromosome number of the species was 2n = 2x = 30. Male meiosis was normal and revealed 15 bivalents at diakinesis. Karyotype was symmetrical (Stebbins's 4a category). All chromosomes possessed median centromere. Chromosome length ranged from 1.10 ± 0.14 µm to 1.98 ± 0.33 µm. Mean chromosome length (MCL) was 1.47 ± 0.24 µm. Pollen grains were tricolporate and prolate with P/E ratio 1.49.

O–T_2 -5: Validation of ITS derived species specific primers of Trifala ingredients for the detection of drug adulteration

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Species specific primers designed for Harde (*Terminaliachebula*), Baheda (*T. bellirica*) and Amla (*Emblica officinalis*) are the three ingredients of Ayurvedic preparation Trifala. The three primers successfully designed from ITS (Internal Transcribed Spacer) region. The aim of the present study is to utilize ITS as an candidate to design species specific primers for the detection of adulteration in herbal preparation. ITS is utilized for plant DNA barcoding for taxonomic identification. ITS 750 bp sequence are amplified with the primers ITS1 (tccgtaggtgaacctgcgg) and ITS4 (tcctccgcttattgatatgc). The resulted sequence compared through Multiple Sequence Alignment (MEGA 6) and specific primers designed from the unique segment of ITS with the help of NCBI Primer-BLAST tool. The resulted species specific primers, each of 20bp, are for Harde (III-C_F.P: tacctgcagagcagaacgac & III-C_R.P: tgccctgttgttggagtacc), Baheda (II-B_FP: gcggacggagctccaaataa & II-B_RP:tcttcatcgatgcgagagcc) and Amla (II-E_FP:caaaacgactctcggcaacg & II-E_RP:attcacgagccccacaagag). The primers are validated on individual species as well as through cross verification. The size of resulted amplicon is less then 200bp. In the present study Trifala is utilized as a tool to design and validate species specific primers as the same technique will be extended for the adulterant species.

O– T_2 -6: Preliminary Molecular Studies on *Musa balbisiana* Complex inIndia

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Musa L., a taxonomically challenging taxon of the family Musaceae, mainly distributed in Tropical Asia from Himalaya to northern Australia. In India, the genus is abundantly distributed in northeastern states, Western Ghats, Eastern Ghats and Andaman and Nicobar Islands. However, the northeastern states harbors the lion share of the genus with 90% taxa and these areas are considered as one of the centers of evolution of the genus *Musa*. *M. balbisiana* is a taxonomically complex species with a wide range of morphological variations. Hence a molecular level approach has been conducted to solve the problems at infraspecific level. Five morphologically different accessions of *M. balbisiana* including already established varieties of *M. balbisiana viz.* var. *andamanica*,var. *sepa-athiya*, and *Bhimkol* and two other accessions from different localities in northeastern India were used for studying the infraspecific variations. Molecular analysis was performed by using Nuclear ITS marker. The molecular study resulted two clades with low Bootstrap support. In one clade *M. balbisiana* var. *andamanica,* var. *sepa-athiya* and "*Bhimkol*"and another clade formed by other two accessions of *M. balbisiana*. So the primary molecular data analysis with one marker (nrITS) showed less variability at the infraspecific level within the *Musa balbisiana* complex. The established varieties of *M. balbisiana viz.* var. *andamanica,* var. *sepa-athiya* and "*Bhimkol*"did not show any variability at molecular level.

O– T_2 -7: Comparative profiling of two hepatoprotective lignans phyllanthin and hypophyllanthin in six *Phyllanthus* species using a validated reversed phase high performance liquid chromatography-photodiode array detection method

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Phyllanthus is one of the largest genus from kingdom Plantae and are widely distributed in most tropical and subtropical countries. This genus is represented by diverse types of plants such as trees, shrubs, and herbs and consists of about 1200 species. Fifty three species of *Phyllanthus* are distributed in India and twenty three species are reported to be endemic. *Phyllanthus* species is one of the 46 important cultivated medicinal plants with high trade .*Phyllanthus* species form an important part of folklore medicines in India and most other contries for thousands of year in the treatment of a broad spectrum of diseases. Almost all species of *Phyllanthus* found in India are used medicinally, especially in the treatment of jaundice.

Phyllanthus species contains therapeutically important organic compounds such as lignans, alkaloids, flavonoids, polyphenols, ellagitannins, triterpenes, volatile oil and sterols. Phyllanthin (Ph) and Hypophyllanthin (HPh) are reported to be the active principles accountable for liver protecting property of many *Phyllanthus* species. Scanty reports are available in the literature for Ph and HPh content in *Phyllanthus* species from India. The present study was undertaken to comparative quantitative profiling of Ph and HPh in eight *Phyllanthus* species using a rapid and valilated HPLC-PDA method.

Whole plants of the six Phyllanthus species namely *P.amarus*, *P.deblis*, *P.maderaspatensis*, *P.reticulus*, *P.urinaria* and *P.virgatus* were collected during the month of August-September, 2017. Plant samples of *Phyllanthus* species (5 g each) were extracted with solvents of varying polarity (hexane, chloroform, ethyl acetate, methanol and water) by refluxing method at room temperature for three consecutive days in order to ensure the maximum possible recovery. The ratio of sample to solvent was 1:20.

Chromatographic separation was achieved using an HPLC (Waters, USA) system consisting of quaternary pumps, an in-line vacuum degasser, an auto sampler and a photodiode array detector, PDA. Injection volume was 20 µL. Compounds were separated on RP-18 Sunfire column (250 X 4.6 mm i.d., 5.0 µm, Waters) in an isocratic elution mode. The mobile phase was a mixture of acetonitrile (solvent A) and water with 0.05 % percent TFA (solvent B) in 1:1 ratio at a flow rate 1 mL/min. Total run time was 30 min in order to ensure any late eluting peak.Chromatographic peaks in the extract samples were identified by matching their retention time and UV absorption spectra with the peaks in the chromatogram of mixed standards. External standard calibration method was used for quantification of all analytes in the extract samples.

For *P.amarus* extracts Ph content varied in following order for leaves extract: methanol>hexane>chloroform>ethyl acetate. In case of stem of *P.amarus*, Ph could be quantified in hexane and ethyl extracts only. For root extracts of *P.amarus*, Ph was

quantified in ethyl acetate extracts only. In case of herbage of *P.amarus*, Ph could be quantified in all five extracts and its concentration was in the following order: hexane>ethyl acetate>chloroform>water>methanol. Hph could not get quantified in methanol and water extracts of herbage of *P.amarus*.Its content was in the following order: hexane>ethyl acetate>chloroform. For leaves of *P.amarus*, Ph was quantified in all extracts except water extract. Its content varied in the following sequence: methanol >chloroform> ethyl acetate>hexane. Further, Hph could not get quantified in any extracts of *P.amarus* root. Also, HPh was detected in hexane and ethyl acetate extracts of *P.amarus* stem.

In case of *P.debilis* herbage extracts, Ph and HPh were quantified in hexane, chloroform , ethyl acetate and methanol extracts. Ph content varied in the following order: hexane >chloroform=methnol>ethyl acetate extract. It was not detected in water extract. Similarly, HPh content was maximum in hexane extract followed by chloroform and ethyl acetate extract. It was not detected in methanol and water extracts.

Ph and Hph were not detected in methanolic extracts of any plant parts (stem, leaves and root) of *P.maderaspatensis*. Also, Ph and Hph were not detected in any extracts of *P. maderaspatensis* herbage extract. For *P.reticulatus* leaves extracts were prepared in hexane, chloroform, ethyl acetate and methanol. Ph and Hph were not detected in any extract of *P.reticulatus* leaves & also in its stem methanolic extracts.

For *P.urinaria* herbage extracts were prepared in water and methanol. Also, in this case neither Ph nor Hph could be detected in any extracts. Ph and Hph were not detected in methanol extracts of hebage of *P.tenellus*and *P.virgatus*.

O– T_2 -8: Simultaneous identification and quantification of coumarin, precocene, β-caryophyllene oxide, humulene and β-caryophyllene in extract of *Ageratum conyzoides* by reverse phase high performance liquid chromatography-photodiode array (RP-HPLC-PDA) method

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Ageratum conyzoides is wide spread in tropical and subtropical region and used in folk medicine of many countries. The *Ageratum* genus, Asteraceae comprises of

about 30 species that are not yet investigated. *A. conyzoides* is aromatic plant that is considered as an invasive and cosmopolite weed. Phytochemicals such as benzopyrenes, flavonoids and terpenoids are reported from *A. conyzoides.* Literature search revealed that there is no method reported for the simultaneous identification and quantification of major bioactive compounds i.e., coumarin, precocene, β-caryophyllene oxide, humulene and β- caryophyllene in *A. conyzoides.* Keeping this view, a rapid and validated UPLC-PDA method was developed for the simultaneous identification and quantification of these aforesaid compounds. Hydroalcoholic extract of *A. conyzoides* was prepared and its UPLC-PDA analysis was carried out using gradient solvent system comprising of acetonitrile and water with 0.05% trifluoroacetic acid. The separation of five compounds was achieved on a RP-18 (250 mm X 4 mm, 5µm) at 40°C with flow rate of 1 µl/min. Peaks were monitored at wavelength of 210 nm. The retention time of coumarin, precocene, caryophyllene oxide, humulene and caryophyllene are 3.99, 10.30, 16.12, 26.67 and 28.03, respectively. Quantification of these five bioactive compounds in extract was carried out by calibration curve of individual compounds.

O–T_2-9: Ethyl Methane Sulphonate Induced Chlorophyll Mutations in *Cyamopsis tetragonoloba* (L.)Taub.

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Dry seeds of *Cyamopsis tetragonoloba* (L.)Taub.var. Golden Early-36 and Harit Rani were pre-soaked in distilled water for 6hrs later soaked in EMS solution of different concentrations like 0.05%,0.10% and 0.15% for 6hrs. Three hundred fifty seeds from each treatment were grown at the experimental farm of Botanical garden of Dr.Babasaheb Ambedkar Marathwada University, Aurangabad. Plant wise and treatment wise capsules were harvested. In the progeny, phenotypically typical plants with regard to chlorophyll development were marked and their frequency recorded. The M3 generation along with respective normal was studied to analyze the mutagenic activity related to chlorophyll mutants due to ethyl methane sulphonate on cluster bean. The chlorophyll deficient sectors were of different types such as yellow (*xantha*), light green (*viridis*) and yellow green (*chlorina*). Such sectors were located at the margins of leaves or spread in lamina

producing beautiful chimeric appearances. They were noticeable after EMS. As the concentration/dose of mutagens increased frequency of chlorophyll deficient sectors were found to increase. The frequency of chlorophyll deficient sectorial plants ranged from 02.00% to 03.60% for 0.05% to 0.15% concentration in GE -36 and 1.73% to 3.33% for 0.05% to 0.15% concentration in HR after EMS treatments in Harit Rani in first generation later in consecutive generations the mutants were screened.

O–T_2 -10: Comparative Assessment of Genetic Diversity Using Floral Traits through D2 Statistics and Molecular Markers in Diverse Species of Tomato

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Tomato (*Solanum lycopersicum*Mill., 2n=2x=24) is an important and most widely grown vegetable crop of both tropics and sub tropics of the world. Wild tomatoes (*Solanum* L. sect.*Lycopersicon* (Mill.) Wettst.)are native to western South America. Different classifications have been based on morphological or biological species concepts. Its thirteen closely related species, along with four closely allied *Solanum* species, provide a defined group with diverse mating systems that display complex interspecific reproductive barriers. The knowledge regarding the extent of variability and genetic diversity of floral traits is of paramount importance while designing a breeding programme and selecting parents especially in case of interspecific hybridization which involves transfer of important traits from the wild species to the already cultivated and popular species. The present study was aimed to elucidate its genetic diversity based on morphological floral traits and molecular markers from 31 accessions belonging to ten species. The different tomato species used under the present study were collected from different national and international centre like IIHR, Bangalore, IIVR, Varanasi, MVRS, AAU, Anand, TGRC, California, USA and AVRDC, Taiwan and all the species are successfully multiplied and maintained at Centre for Distant Hybridization in Field and Fruit Crops, Department of Agricultural Biotechnology, AAU, Anand. Analysis of variance and D^2 statistics using Mahalanobis distance revealed significant differences in all the

metric traits and sufficient inter-cluster distances indicating considerable diversity among the accessions. The ISSR and SSR generated high level of polymorphism with mean PIC (Polymorphic Information Content) values of 0.81 and 0.61, respectively. Total two SCAR primers gave amplification specific to resistance and susceptibility for ToLCV and root knot nematode. The banding pattern generated by SCAR could sufficiently discriminate all the 31 genotypes for ToLCV and root knot nematode resistance. The present study yielded congruence between its breeding system and markers thus elucidating the usefulness of complementary approaches to make diversity analysis more explanatory and purposeful for optimum genetic amelioration and to implement effective interspecific hybridization programme.

O–T_2 -11: Evaluation of Leaf Shape in Plant Systematics Using Morphometric and Technological Approach

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Plant has plenty of uses at home, industry and also vitally important for environmentalprotection. However, it is an important and difficult task to recognize plant species without theexpert identification. Hence, designing a convenient and automatic recognition system of plantsis necessary and useful since it can facilitate fast identifying, classifying, and understandingabout plants in nature. The growing interest in biodiversity and the increasing availability ofdigital images combine to make this topic timely. Easy access to computers has created arevolution in the analysis of biological data. This study is being initiated to develop a plantspecies biometric by using both global and local features that are specific to leaf images ofdifferent species. Leaves can be a useful source of taxonomic information in plants particularlywhen flowers and fruits are absent during certain period of the year. In this study, we applied anelliptic Fourier analysis (EFA) - based morphometric technique to assess leaf morphological differences among ten species of family Convolvulaceae A. L. Jussieu. Using leaf images of allthe species collected from different places of Baroda, we have extracted three shape variablesfrom the Fourier coefficients and used these variables to describe leaf outline among the species and construct the dendrogram which helped us to segregate the species for identification. Thispreliminary study shows that leaf shape analysis through the digital method can be used as a toolfor identification of the plant. Approach of such plant identification

will help professionals aswell as non-professionals to identify plants efficiently and accurately.

O–T_2 -12: Diversity of intraxylary phloem in selected members of family Convolvulaceae

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The phloem, located at the periphery of the pith is referred as intraxylary (internal) phloem and is a one of the diagnostic feature of family Convolvulaceae. In the present study range of diversity in the ontogeny and structure of intraxylary phloem is investgated in selected members viz. *Argyreia*, *Cressa*, *Dicranostylis*, *Ipomoea*, *Jaquimontia*, *Maripa*, *Merremia* and *Turbina*. Present study revealed formation of internal phloem from the marginal pith cells, by developing internal cambium which may be functionally unidirectional, bidirectional or forming successive internal cambia. In contrast *Argeia* species showed medullary bundles as well as internal phloem formed from pith cells or from the internal cambium. Ontogeny of internal phloem, internal cambium and medullary bundles is described in detail and its possible significance is described by using selective members of the family.

Theme 3: Biodiversity and Conservation Assessment of Flowering Plants

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O-T_3-1: The sub-tribe Platantherinae (Orchidaceae) in India

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The family Orchidaceae comprising 20,000-25,000 species under 770-880 genera (APG IV, 2016) account for eight percent of total flowering plants. India harbors 1331 species in 184 genera (Misra, 2007). In India, the sub-tribe Platantherinae (subfamily: Orchidoideae, tribe: Orchideae) is represented 4 genera namely, *Hemipilia* Lindl., *Hemipiliopsis* Y.B. Luo & S.C. Chen, *Pecteilis*Raf. and*Platanthera* Rich. The sub-tribe Platantherinae is restricted distributed in Himalayan & Peninsular India and completely absent in Andaman & Nicobar Islands. No specific work done for this sub-tribe in India and in the present study, I focused on taxonomy, distribution and conservation aspects. The present study carried out as part of AJCB-PDF research project on 'Taxonomic revision of Sub-tribe Platantherinae (Orchidaceae) in India' sponsored by Botanical Survey of India.

In the present study a total of 22 species were considered. In this sub-tribe the largest genera are the *Platanthera* with 17 species followed by *Pecteilis* with 3 species. The genera *Hemipilia* and Hemipiliopsis are represented by single species. The genus *Hemipilia* was distributed in North-West Himalaya (H. cordifolia Lindl.) and *Hemipiliopsis* is restricted to North-East India (*H. purpureopunctata* (K.Y. Lang) Y.B. Luo & S.C. Chen). The genus *Platanthera* was distributed in both the regions, North-East and North-West Himalaya and *Pecteilis* is distributed in Himalayan and Peninsular India. In present study area these species are experiencing many threats like habitat destruction, grazing, encroachment of forest for agriculture and plantations.

O-T_3-2: Rediscovery of *Flemingia angustifolia* Roxb. after 96 years and its neotypification

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As a part of taxonomic revision of the genus *Flemingia* we came across a species closely allied to *Flemingia prostrata*. The species was collected twice (2016 and 2018) from Shillong, Meghalaya. Critical studies led to its identification as *Flemingia angustifolia*, a species that was described by Roxburgh in 1832 in his seminal work Flora Indica. However, Roxburgh (1832) did not provide an illustration for it. Consequently, this species was omitted in the taxonomic treatise Flora of British India. Nonetheless, Haines (1922) reported this species in his Flora of Bihar and Orissa. Later taxonomic studies on the genus also by Mukerjee 1953, van der Maesen 1985 and Satyanarayana 1993 did not recognize this species. Similarly, Legumes of India (Sanjappa 1992), a checklist synonymized *F. angustifolia* under *F. macrophylla*.

Flemingia angustifolia has not been reported since Haines's work. Here, we report this species after 96 years. Search for the type of this species revealed the absence of original material. Therefore, a specimen having well-developed inflorescence and tallying with the diagnosis given in the protologue has been chosen as a neotype here. Additionally, a comparative account of *Flemingia angustifolia* and *F. prostrata* is provided for easy identification.

O-T_3-3: The diversity and distribution of family Aristolochiaceae in Southern Western Ghats, India

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Antoine Laurent de Jussieu was a French botanist working at the Museum d' Histoire Naturelle, and the most forceful promoter of the natural system. He proposed the family Aristolochiaceae based on genus *Aristolochia* L., in 1789. The Family has about 12 genera 500 species distributed mainly in the tropical and warm temperate regions of the world. In India, the family is represented by three genera viz., *Aristolochia*, *Asarum* and *Thottea*, of these only *Aristolochia* and *Thottea* are in the Western Ghats. Pertained to the two genera, a total of 15 native and 6 exotic species were reported from the study area, including 11 endemic species. *Thottea barberi*, *T. dalzellii* and *T. sasidharaniana* are critically endangered whereas *T. barberi* is

represented mainly in the Agasthyamala Biosphere Reserve and the rest are seen in the northern parts of Kerala. The present study is focussed on the species diversity, distribution, and intra specific variability of selected species of Aristolochiaceae occurring in the southern Western Ghats.

O-T_3-4: Conservation of germplasm of Sorghum in tribal belt of western Madhya Pradesh

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Land races are the storehouse of many novel genes of a crop. Nature has gifted them adaptability towards various kinds of stresses such as draught, cold, temperature, diseases, pests etc. Hence, in situ and ex situ conservation and usage of these local races for plant breeding programmes is worth to accept the challenges of future to fulfil the growing demand of food for increasing population.

Sorghum is an important staple food crop of western Madhya Pradesh. About 30 landraces of Sorghum are in active cultivation. 20 accessions were collected from Khargone district, followed by Barwani (10½, Alirajpur (13), Dhar and Jhabua (10 each). The study was based on plant height, panicle size, seed size, grain colour, maturity dates, and uses.

Variability among the collections is very high. Most of the accessions are tall (20) in plant height, semi compact ear head (13), bold seeded (25) and white coloured seed (20) to pearly white (4). Out of these ¼10½ is very early flowering and matures at 75 days with tolerant to disease and drought. Majority of the accessions are used as food and fodder.

White and Brown Sorghum grains are mainly used for 'Roti' (90%), 'Ghat' (50%) 'Rabadi' (30%), 'Ghugari' (20%) and (10%) 'Dhani', 'Bhuyada' etc. (30%) While red grains are used for local 'Pappad' and'Laddu' (5%). So, present paper reflects the information of 30 landraces of Sorghum cultivated by Tribals of western Madhya Pradesh.

O-T_3-5: An overview of Biodiversity with special reference to their databases

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Biodiversity is the very basis of plants and human survival and economic well-being, and encompasses all life forms, ecosystems and ecological processes. The current estimates of the total number of species on earth vary from 5 to more than 100 million, with a more conservative picture of 13.6 million species. Of these, only 1.78 million species have yet been described and awarded proper scientific names. Thus, our knowledge of diversity is remarkably incomplete. Biodiversity at any point in time is the balance between the rates of speciation and extinction. Biodiversity is not uniformly distributed on the earth and shows prominent latitudinal and altitudinal gradients. At least five major mass extinctions have occurred in the past at geologic-time boundaries. Studies indicate that we have entered into the sixth phase of mass extinctions. In all ecosystem types, terrestrial, freshwater and marine, species populations are declining. The current rates of species extinction are 100–1000 times higher than the background rate of 10-7 species/species year inferred from fossil record. It is now in the order of 1,000 species per decade per million species. Today we seem to be losing two to five species per hour from tropical forests alone. This amounts to a loss of 16 m populations/year or 1,800 populations/h. Major drivers for changes of biodiversity in future, in decreasing rank of their impact are land use change, climate change, N deposition, biotic exchange and atmospheric loading of CO2. The concept of biodiversity banking could induce public participation. Establishment of the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services, an independent, international science panel (like IPCC) would help coordinate and highlight research on pressing topics, conduct periodic assessments on regional as well as global scales and provide predictions. Our country has mass populated and fortunately on the biodiversity point of view has 4 hotspots zones and designated itself as a mega diversity country. The massive development of biodiversity related information systems over the WWW (World Wide Web) has created much excitement in recent years. These arrays of new data sources are counterbalanced by the difficulty in knowing their location and nature. However, biologists and computer scientists have started to pull together in a rising tide of

coherence and organization to address this issue. The fledging field of biodiversity informatics is expected to deliver major advances that could turn the WWW into a giant global biodiversity information system. The present paper briefly reviews the databases in preserving the biodiversity data.

O-T_3-6: An ecological observation on hemi-epiphytic germination of *Ficus benghalensis* L. (Moraceae) in Sathyamangalam Tiger Reserve, Southern Eastern Ghats

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This paper discusses the host plants of a hemi-epiphyte, *Ficus benghalensis* (Banyan tree) in Sathyamangalam Tiger Reserve. Extensive surveys were conducted in three Forest Ranges namely Bhavanisagar, Sathyamangalam and Talamalai during January 2016 to June 2017. Host plants of *F. benghalensis* were observed using belt transect surveys. A total of 144 individuals of banyan were observed on 35 different species of host plants. *Tamarindus indica* harboured highest number (n= 25) followed by *Borassus flabbellifer* (n=18). Among the host plant families, Caesalpiniaceae harboured the largest proportion (29.17%) of banyan trees. Banyan was found growing on both rough (57.12%) and smooth barked trees (42.78%). The colonization position of the host trees revealed that the 1st crotch harboured highest number of individuals (72.22%) followed by main trunk (20.13 %), 2nd crotch and branch limb.

O-T_3-7: An expedition to Lhonak Valley, Sikkim

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Lhonak valley of the Sikkim Himalaya is one of the richest phytodiversity centres with hundreds of botanically interesting species. The valley is with area of about 200 sq. km. This region is situated at extreme north- west corner of the state Sikkim and

under alpine regime (4000- 6000 m amsl.). The floristic diversity of the region is spectacular. The forest of the region is mostly alpine pasture with some typical Himalayan marshy valleys. This region is exceptionally rich in endemic and RET species. In recent expedition the floristic diversity of the region is illustrated. About 150 species of angiosperms and four species of gymnosperms have been collected. Some characteristic elements, viz. *Cavea tanguensis, Gentiana springateana, G. vernayi* subsp. *vernayi, G. vernayi* subsp. *favrei, Kuepferia kanchii, Lomatogonium cherukurianum, Meconopsis horridula, Nardostachys jatamansi, Podophyllum hexandrum, Rheum nobile, Spongiocarpella purpurea* var. *lhonakia*, etc. In the present paper the pattern of distribution of flowering plant species have been provided. Moreover, the change in vegetation pattern in recent years is also discussed.

O-T_3-8: Biomonitoring of angiosperm diversity in the granitic hillocks of Palghat gap, Southern Western Ghats, Kerala, India

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This pioneer attempt on bio-monitoring of angiosperm diversity in the granitic hillocks of four different forest ranges in Palghat Gap of southern Western Ghatshad resulted in the documentation of 481 taxa belonging to 327 genera and 89 families with Fabaceae forming the dominant family. The study could document the threatened category taxa,*Decalepishamiltonii,Cleistanthus collinus, Santalum album, Cayratia pedata* and *Pterocarpus marsupium*. The observations on high level of intraspecific variation in the rocky outcrops by *Andrographisechioides, Hibiscus lobatus* and *Chamae cristaabsus*may be due to the tendency of taxa to strive the stress induced by the harsh edaphic and climatic regimes in the Palghat gap area. The prevalence of anemochorousphanerophytes like*Terminalia paniculata, Dodonoea viscosa,Holoptelea integrifolia, Pterocarpus marsupium* etc. isan observable adaptive strategy for efficient dispersal in the strong desiccating winds through the gap. The frequency of therophytes, dry deciduous and scrub jungle elements like Euphorbia

trigona, Decalepishamiltonii etc. serve as indicators of acute water shortage and high temperature during the dry phases of the rocky hillocks. The development of carnivorous, semi-parasitic, parasitic and succulent taxaand plant associations in the chasmophytic habitats during wet and dry phases with differential manifestations serve as indicators for bio-monitoring in these rocky out crops. While the findings of *Olden landiadineshii* and *Dipcadi montanum* from these fragile habitats in the gap adds to the floristic diversity of Kerala, biological invasion by *Mikaniamicrantha, Chromolaena odorata, Croton hirtus*and*Hyptis suaveolenspose* threats to the native vegetation.

O-T_3-9: Strategies and efforts in Conservation of Native Trees of Gujarat

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Native plants are equipped to live with the local climate, soil types and animals. Plants and animals that have evolved together depend upon each other for survival and form a complex network of relationships and healthy ecosystem. Marking Candidate Plus Trees (CPTs) for native species is an important part of all conservation, afforestation and reforestation programmes. Objectives of marking CPTs are to increase productivity, to improve the quality of forest species, to develop resistance against insect-pests and to adapt the species to unfavorable conditions. Since more than a decade Silviculture and Forest utilization circle of Gujarat Forest Department is engaged in marking CPTs of various native species in the eastern belt of state's forests. So far more that 6000 trees have been marked as CPTs for more than 60 native species and every year seeds are been collected and new saplings are being raised such way. To avail the data of such CPTs to the stakeholders we have developed a mobile application i.e. SILVA Information System; through which forest managers and conservationist may reach to desired CPT tree using maps. Also the can access the data for how many trees so far the CPTs have been done and their coordinates and for how many species, saplings are available at which research station of this circle. The application will be an useful resource for forestry researchers, students, environmentalists and ecologists.

O-T_3-10: Diversity of the genus *Impatiens* L. (Balsaminaceae) in Kanchenjunga Biosphere Reserve, Sikkikm

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The Kanchenjunga Biosphere Reserve of Sikkim Himalaya, with more than 1500 species of flowering plants, is one of the best floristically rich areas of the country. Among the most diversified genera in the forest of the reserve Impatiens L. with more than 15 species out of 24 species of the state occupies an important position. The genus with its unique species diversity is well flourished throughout the biosphere reserve from subtropical to alpine forests. The diversity along with habitat ecology, phenology, distributional pattern, etc. is discussed. Moreover, the horticultural potentialities of different species of the genus are also illustrated. Critical taxonomic comments have been made for certain species. An artificial key is also provided to facilitate easy and correct identification.

O-T_3-11: Exploration and Conservation of Wild Cucurbits in Telangana State, India.

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Cucurbitaceae (or) Gourd Family is an important group of vegetable crops cultivated in tropical and subtropical countries. It ranks the highest among of plant families for number and percentage of species used as human food. These plants are characterized by annual vines, pentangular stems and tendrils are present at 900 to the leaf petioles at nodes. Cucurbitaceae consists of about 975 species in around 95 genera. In our present investigation we have identified, collected and documented 25 species belong to 15 genera. Among the 25 species 11 species are being cultivated and 14 species are wild. Wild species are *Citrullus colocynthis* (L.) Schrad, *Corallocarpus*

epigaeus(Rottl.& Willd.), *Ctenolepis garcini* (L.) C.B. Clarke, *Cucumis callosus* (Rottb,) Cogn, *Cucumis maderaspatanus* L, *Diplocyclos palmatus* (L.) Jeffrey, *Luffa cylindrica* (L.) Roem, *Momordica dioica* Roxb, *Solena amplexicaulis* (Lam.) Gandhi, *Solena umbellata* Willd, *Trichosanthes cucumerina* L, *Trichosanthes tricuspidata* Lour, *Zehneria maysorensis* (Wt. & Arn.) Arn, *Zehneria scabra* (L.f.) Sonder. We have adopted plant tissue culture technique for the conservation and multiplication of tuberous wild cucurbits like *Corallocarpus epigaeus, Momordica dioica, Solena amplexicaulis, Solena umbellata* and *Trichosanthes tricuspidata* are succeded. High frequency regeneration of these species is under progress for fast conservation. Seasonally we are exploring for other wild cucurbits in Telangana region. Database documentation of these plants is in progress.

O-T_3-12: Floristic studies and conservation significance of Riparian system in the Thutha river basin , Southern Western Ghats, Palakkad, Kerala

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The inquiry on the floristic composition, of riparian vegetation along Thutha river, a tributary of Bharathapuzhaoriginating from the upper slopes of the eastern side of Silent valley hills, revealed 582 species of flowering plants under 110 families.The floristic documentation showed the dominance of thirteentypical riparian taxa viz. *Homonoiariparia, Mallotus nudiflora, Madhuca neriifolia, Pandanus furcatusetc*and 95 typical wetland elements. Fifty six taxa, collected from the riparian areas of Thutha river are endemic to various geographical boundaries of India. Among the recorded taxa, 210 species have been newly added to Palghat flora (Vajravelu, 1990) and of these, 46 taxa showed extended distribution in Palakkad and Malappuram districts. Taxonomic inventorying also recorded *Lindernia tamilnadensis*Prasad (Linderniaceae) as an addition to flowering plants of Kerala. The riparian system of Thutha harbours a rich diversity of medicinal plants (244 species), which contribute 42% of the total riparian flora of river Thutha and this constitutes valuable habitats for faunal elementslike Otters, Turtles and Fishes.However intense anthropogenic activitiescause the disappearance of native species and ultimately result in the dominance ofinvasive elements such as *Lantana camara, Ageratum conyzoides*,

Mikania micrantha, Synedrella nudiflora, Chromolaena odorata etc.and their spread results in native species loss, reduced species richness, diversity, evenness and decreased river flow.The inventory indicate that there is an urgent need to develop strong conservation and restoration measures for the riparian system of this river which in turn can enhance the ecosystem balance of this riparian zone.

O-T_3-13: Flora of Bellary District, Karnataka

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Bellary district is spread from southwest to northeast and is situated on the eastern side of Karnataka state. The district is 15° 30' and 15°50' north latitude and 75° 40' and 77° 11' east longitude. This district is bounded by Raichur district on the north, Koppal district on the west, Chitradurga and Davanagere districts on the south, and Anantapur and Kurnool districts of Andhra Pradesh on the east. The important river is Tungabhadra. Hagari and Chikkahagari are two streams. The western taluka of the district are dogged with scarcity conditions with the failure of rains during successive years. Bellary district is rich in natural resources which need to be tapped to a great extent for overall development of the district. Sandur the princely state, which had an area of just 1258 sq. kms. Sandur Hills and Sogi Mellesh Betta in the district are the major forest area. These hills are (MSL) 300 – 1040 m high.

In view of biodiversity act 2002, thorough exploration of the flora, fauna and documentation of traditional knowledge is most urgent and complete with in a short span of time, particularly regional flora and fauna. The inevitable and rapid destruction of much of the world's vegetation, many taxa will be irretrievably lost in the near future. The plant materials in both flowering and fruiting were collected during 2016 and 2017 by frequent field trips to different spots (locations) and seasons of the study area. The collected specimens were pressing by dry method. The present preliminary study reveals about, 92 families, 320 genera, 535 species in which, medicinal- 79, rare- 12, vegetable- 11, edible fruit - 24, gum and resin- 8, oil- 4, timber- 14, green manure- 8.

O-T_3-14: How the vegetation got altered due to climate change?-A case study from the Nilgiris,The Western Ghats, TamilNadu, India.

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India has some of the most biodiversity regions of the world with fourth of the world's 36 biodiversity hotspots –Western Ghats, the Western Himalaya, the Eastern Himalayas along with Myanmar and Sundaland. India is one of the seventeen mega-diversity countries i.e. home to about 60-70 % of the world's biodiversity Many eco-regions, such as the shola forests, also exhibit extremely high rates of endemism; overall, 33% of Indian plant species are endemic. Forests are repositories of genetic diversity and supply a wide range of ecosystem services thus helping maintain ecological balance. Forests meet nearly 40% of the energy needs of the country overall and over 80% of those in rural areas, and are the backbone of forest-based communities in terms of livelihood and sustenance. Forests sequester billions of tons of carbon dioxide in the form of biomass and soil carbon. If elevatedCO2 does not generally promote C3 species, then it is likely that the C4 component of (some) C3/C4 grasslands will actually increase, driven by global warming. This present work could serve as a potentially important source of information about climate change science in relation to vegetation in the Nilgiris and a useful source for evaluating the potential sensitivity of vegetation to climate change. Hybrid ecosystems retain some original ecosystem characteristics as well as novel elements, whereas novel ecosystems comprise different species, interactions, and functions than past ecosystems. The study area comprises, novel mixer of species, less desirable native species, non-native species might be used to maintain valuable hybrid or novel ecosystems and their services (high carbon storage, resistance to fire or invasive species, wildlife habitat). The ability of plants to adapt to these changes through phenotypic plasticity, local adaptation and migration. The present study carried out on the effect of climate change on forest in the Nilgiris and it has resulted in the collection of 153 invasive alien species and it is realized that these group of plant pose a grave threat to the native vegetation next to the habitat destruction. Out of these, the predominant species like *Acacia mearnesii* (Mimosaceae) *Ageratina adenophora* (Asteraceae) *Cytisus scoparius* (Fabaceae) *Pinus patula* (Pinaceae) *Principia utilis (*Rosaceae*)* and *Ulex europeus* (Fabaceae) found to occur at higher

altitudes(2200m) are more obnoxious; the less obnoxious ones such as *Cestrum auranticum* (Oleaceae) *Helichrysum bracteatum* (Asteraceae), *Phylocca octandra* (Phytolacaceae) *Rubus ellipticus* Sm. (Rosaceae) *Solanum mauritiana* (Solanaceae) could be collected at 1800m. Some of the exotics like *Chromalaena odorata* (Asteraceae) *Lantana camara* (Verbinaceae) and *Senna didymoptera* (Caesalpiniaceae) are located at lower altitudes (700-900 m). The resilent plants like *Scutia myrtina* (Rhmnaceae), *Gymnosporia emarginata*, (Celasteraceae) *Heteropogon contortus* (Poaceae) *Caesalpinia cristata* (Caesalpiniaceae) and *Tithonia diversifolia* (Asteraceae) also could be noticed at different altitudes. Due to climate change, the phenotypic plasticicity was noticed among *Habenaria heyneana* Lindl. (Orchidaceae), *Dichanthium oliganthum* (Poaceae) and *Schenorchis filiformis* (Wight) Schltr. (Orchidaceae). In recent years the plants such as *Alternanthera ficoidea* (Amaranthaceae), *Eryngium foetidum* (Apiaceae) *Mikania micrantha* (Asteraceae) *Mimosa diplotricha* (Mimosaceae) *Solanum pseudo-capsicum* (Solanaceae) and *Tithonia diversifolia* (Asteraceae) spreading much faster in the vegetation at different altitudes is symptom of climate change. It is quite interesting to know that the migration of a solitary plant like Hypericum japonicum (Hypericaceae) in the study area and other related issues will be discussed in detail.

O-T_3-15: A Distributional note on *Tripogon polyanthus* Naik & Patunkar (Poaceae)

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Tripogon polyanthus was described by Naik and Patunkar from Marathwada region of Maharashtra on the year 1976. Since that, this species was not collected from its type locality and other than type locality. During the exploration of grasses of Maharashtra state, authors have collected the *T.polyanthus* from six localities other than type locality. Thus, in present communication discuss on distribution of *T. polyanthus.*

O-T_3-16: Web base GIS survey of Major available Medicinal plants of Jaynagar -1 Block, South-24 Parganas, West Bengal, India.

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Jaynagar-1 is a block of South-24 Parganas district in the Indian State of West Bengal. The town Jaynagar is an ancient place. The name of Jaynagar was originated from the name of the local goddess "Joychandi". During the course of time it became "Joychandinagar" and then "Jaynagar". Knowledge of medicinal plants and their uses as medicine has been an integral part of the culture of Bengal since ancient days. Despite this, very little information exists on the flora in general of our concern area, and medicinal species found within its particular periphery. It is urgent to document this information before such valuable plants gets extinct during the course of urbanization. The importance of traditional knowledge is now being increasingly popular all over the world. The pharmaceutical industry continues to explore and confirm the efficacy of many medicines used by traditional communities. Proper conservation of medicinal plants require proper mapping of their habitat. Identification of the spatial location is a prerequisite for the exact habitat and conservation of the medicinal plants. Here GIS has been used as a map maker. Plant species exact area can be identified through the software Arc GIS 10.5 for visualizing and analyzing, creating data with a geographic tool. Identification, mapping using Arc GIS 10.5 and findings of medicinal importance from available literature of the naturally occurring medicinal plants of Jaynagar -1 South-24 Parganas, West Bengal, India is our main concern

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O-T_3-17: Distribution & Diversity of the Genus *Heliotropium* L. (Boraginaceae) in India

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The genus *Heliotropium* L. belonging to the family Boraginaceae consists of about 250 species worldwide. It is a widespread genus originating from the Old World tropics and subtropics which is spread to the warm temperate zones of all continents. The genus is well represented in India with 22 species of which 11 species occur in peninsular India. In India they are mainly distributed along the Gangetic plain, Deccan peninsula, Central India, Assam and Western coast of Malabar.The genus generally includes herbs rarely undershrubs or shrubs. Plants are characterizedby short stiff hairs on stems and leaves, flowers in terminal scorpioid cymes, calyx deeply 5-cleft, corolla tube 5 lobed, stamens 5 inserted in the corolla tube, ovary imperfectly 4 celled, 4 ovulate, ovules pendulous, fruit nutlets.
The genus *Heliotropium* has been neglected taxonomicallyin India, with not much work carried out on it. A thorough and extensive study is essential to have complete data on the occurrence and distribution of *Heliotropium* in India.*H. indicum* L. and *H. supinum* L. are the two most commonly occurring species in India. *H. indicum* L. reaches about 2 ft. in height, seen along the sunny localities in wastelands and coal fields while *H. supinum* L. is a prostrate, villous herb found in cultivations and black soil tracts. The Present paper discusses the distribution as well as the diversity of this particular genus in India.

O-T_3-18: Evaluation of Floristic Diversity of Bilaspur and its adjoining areas :Assessing the impact of urbanisation

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Chhattisgarh, the 26th state of India has ample variation in physical and cultural features. Lying between 170 45'N to 240 6'N latitude and 800 15' to 840 51' E longitude, it has about 44% of its geographical area covered with forests. It enjoys hot and humid climate. It gains rainfall from both north-east and south-west monsoon. It has about 30 small and big drainage systems. Thus, the herbal state of Chhattisgarh houses an important part of the rich and unique biological diversity.

What is more conspicuous is that the state is significantly rich in endemism with respect to many plants having medicinal importance. The forests of the state fall under two major forest types, i.e. Tropical moist deciduous forest and Tropical dry deciduous forest. The State of Chhattisgarh is endowed with about 22 varied forest sub-types existing in the state.

Floristically, Sal (*Shorea robusta*) and Teak (*Tectona grandis*) are the two major tree species in the state. Other notable underwood spp. are Bija (Pterocarpus marsupium), Saja (*Termanalia tomentosa*), Dhawra (*Anogeissus latifolia*), Mahua (*Madhuca indica*), Tendu (*Diospyros melanoxylon*) etc. Amla (*Emblicaofficinalis*), Karra (*Cleistanthus collinus*) and bamboo (*Dendrocalamus strictus*) constitute a significant chunk of middle canopy of the state's forests.

Bilaspur district is situated between 21037' and 2307' E latitude and 81012' and 81040' E longitude. After the formation of the state there has been a vast growth of urbanisation and road constructions which has adversely affected to the flora of the district in general and Bilaspur and its surroundings in particular.

Viewing this, present study was done to evaluate the floristic diversity of the flowering plants during 2016 -2018 in Bilaspur and its adjoining areas. Study reveals a distribution of 290 genera and 379 species of flowering plants distributed in 94 families of dicotyledons and monocotyledons. Two hundred and twenty four genera of dicots with 292 species and 66 genera of monocots with 87 species were found. This is very less as compared to the enumerations by Panigrahi and Murthy (1989) published by BSI.[120 families;507 genera and 852 species] However present study does not contain the data on district as a whole. It has been restricted to the Bilaspur city and its adjoining areas.

O-T_3-19: Is Alexender's lost army still dependent of wild phyto-resources?

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Dards (Brokpas) seem to be of unadulterated Aryan stock settled on both banks of Indus River in Kargil district of Jammu and Kashmir. Upstream to Batalic sector on Indo-Pak Frontier, Aryan Valley encompasses 03 Dard villages named as Dha-Hanu, Darchik and Garkun. The residents of these villages seem to be different from Bot

tribe or Shiya Muslims of nearby villages with respect to their height, eye colour, sharp features, culture and creed. These people have a conviction that they follow their hereditary history from Alexander's armed force. Few historians believe that while moving back to Greece, Alexander misplaced few soldiers of his army near and around river Indus. Later on these misplaced warriors got established on the Indus banks and maintained their antiquated dialect, custom, culture and racial attributes since 200 BC. They are strong believer and worshiper of Fire and Lord Shiva (stone). The Dard clan has around 2,500 individuals settled in three villages. To preserve the immaculateness of race they didn't marry outside their valley. They cultivate many plant species for their daily requirements like Apple, Apricot, Walnut, Cherries, Vegetables and Barley etc. Further, they also collect wild plant species for their regular usage. Although the practice of wild plant usage is not so frequent, however collection of few species is linked with religion. Dards have now adopted Buddhist or Islamic Religion, therefore the usage of the wild phyto-resources is now limited among this community. The paper will try to analyze the extent of usage of wild phyto-resources by the Alexander's lost army.

O-T_3-20*: Thismia* (Thismiaceae): A little known genus in India which needs special attention

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Thismia is a poorly studied mycoheterotrophic genus belonging to the family Thismiaceae consisting of about 63 taxa, mainly distributed in warm temperate and tropical Asia, eastern and south-eastern Australia, New Zealand and the neotropics. Itis a taxonomically complicated genus. The fungus-like tiny habit, delicate nature and short lifespan makes it difficult to observe in the soil or amidst leaf litter. The major taxonomic characters used for species delimitation are the mitre, mitral appendages, perianth lobes and anther morphology.In India, the genus consists of two species viz. *Thismia aurantiaca* Hareesh & M.Sabuand *T. sahyadrica* Sujanapal et al.*T. aurantiaca* was recently published from Andaman and Nicobar Islands and *T. sahyadrica* from Kerala. Detailed morphology of the genusis discussed in detail.

O-T_3-21:Floristic composition and Phenology of Kallamalai hills of Southern Eastern Ghats, Tamil Nadu, India

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The study was carried out at Kallamalai hills Rasipuram Taluk, Namakkal district, Tamil Nadu, India. The vegetation analysis was enlisted 464 species and 251 genera of angiospermsbelong to 75 families. The pattern of reproduction was analyzed by classifying species on thebasis of the season of flowering whether the flowering is confined to one season or moreseasons. Herbs dominated with 224 species (48.27%) followed by trees with 86 species(18.53%), Shrubs with 59 species (12.71%), Climbers with 55 species (11.85%), Prostrate Herbwith 35 species (7.54%). Parasite with 5 species (1.07%).During Post monsoon period Jan-Feb 24 species (5.19%) were in flowering and 133 species (28.79%) were in fruiting. In Pre monsoon period March-May 37 species (8.01%) werein flowering and 54 species (11.69%) were in fruiting. In South West monsoon period June-Sep75 species (16.23%) were in flowering and 27 species (5.84%) were in fruiting. InNorth Westmonsoon period Oct – Dec 187 species (40.48%) were in flowering and 58 species (12.55%)were in fruiting. Flowering phenology largely take place during North West monsoon andfruiting phenology largely take place during Pre monsoon as evidenced by the study. An attemptwas made to compare with Phenology of plant species of Kallamalai hills at present (2016) andstudies was made by Matthew at the same area in 1991. The study revealed the phenology of thestudy area present and past.

O-T_3-22: A study of plant diversity of chitrakoot- the legendary place of India

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Chitrakoot means the 'Hill of many wonders is indeed a gift of nature and the gods and located on the banks of river Mandikini and falls in the northern Vindhyan range

of mountains spread over the states of Uttar Pradesh and Madhya Pradesh. The major part of Chitrakoot is situated in the northern region of Satna district of Madhya Pradesh and surrounded on north, northwest and northeast by Chitrakoot district of Uttar Pradesh and west by Panna District of Madhya Pradesh. It is lies between 80º 52′ to 80º 73′ N latitude and 25º10′ to 25º 52′ E longitude, covering an area of 1584 sq km. The forest of the Chitrakoot predominantly consists of tropical dry mixed deciduous type. The climate is dry and the maximum temperature goes up to 50.5^{0}C in the month of May and minimum up to 5 ^{0}Cin the month of January.

Since times immemorial, Chitrakoot is famous for its religious importance, elegant environment and spiritual peace. It is also well known for its beautiful hill ranges, historical caves, perennial streams and varied flora and fauna. Therefore, the Chitrakoot has been sacred place of worship for sages and hermits since antiquity. Chitrakoot's spiritual legacy stretches back to legendary ages. It was in these deep forests that Lord Ram, Sita and his brother Lakshman spent eleven and half years of their fourteen years of exile. In several ancient epics, ancient literature and poetical works like *Ramayana* (written by Adikavi Valmiki) *Shri Ramcharitmanas* (Goswami Tulsidas), *Raghubans* (Kalidas) etc the rich biodiversity has been described comprehensively.

But at present, the biodiversity of Chitrakoot is declining fast due to the degradation of habitats by heckles and indiscriminate cutting of forests for timber, fuel wood, expansion of agriculture, construction of roads, querying of stones, grazing, invasion of alien weeds, overexploitation of plants for medicines etc. Therefore, a detailed taxonomic survey has been carried out. A total of 790 plant species, belonging to 486 genera and 111 families have been reported and analyzed during the study. For conserving valuable medicinal and rare and endangered plants, a herbal garden has been established in Arogyadham campus. The details of the present paper will be illustrated during the presentation of conference.

Theme-4: Ethnobotany, Medico-Botany, Biofuel and Bioprospecting

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O-T_4-14	Pollination efficiency, syndrome of Indian Honey bees, Apis cerana indica in Coccinia grandis (L.) Voigt (Cucurbitaceae)	**N R Raseena** & S Suhara Beevy	**109**
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HP-TLC for Botanicals Analysis

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High Performance Thin Layer Chromatography has recently become the primary regulatory technique for identification of materials of botanical origin, due to its inclusion in almost all pharmacopoeias, all over the world, in the last couple of years. In Aug. 2015 USP legalised a new SOP (Chapter 203) for instrumental TLC and this is now the true HP-TLC. Implementation is a matter of time but all materials of botanical origin will soon be "identified" by HP-TLC fingerprint technique. HP-TLC Fingerprint represents the phytochemical composition of botanical origin samples in a photographic form. Only HP-TLC is suitable for this purpose as the fingerprint is a photo. The identification test automatically detects adulteration and dilution! The International Pharmacopoeia however recommends the quantification of certain "marker" compounds. HP-TLC is capable of fingerprint, as well as quantitative analysis.

HP-TLC technique and methodology are different from TLC although principle is the same. HP-TLC is ten times faster and ten times cheaper in analysis cost than HPLC and hence first priority in educational institutes. HP-TLC is the only technique suitable for analysis of complex and variable matrix samples like herbals and foods. No herbal analysis lab can be complete without HP-TLC.

Various applications to support the above views will be presented, based on real life samples, suitable for novices as well as experts.

O-T_4-1:Phytochemical, Proximate & Antioxidant analysis of Seed of *Bauhinia variegata* L.

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Bauhinia variegate L. is the middle size tree. Leaves broadly ovate, usually broader than long. Flowers few in Axillary, short corymbose racemes. Plant commonly known as Kanchan in Marathi while Kachnar in Hindi.This study was performed the phytochemical screening of mature seeds, while proximate and antioxidant of immature and mature seeds. Ash content estimated by AOAC method (1990).Crude fat, crude fiber contents determined by Sadasivam and Manickam (1992). Carotenoids were carried out following the method of Kirk and Allen (1995). Powder behavior shows the presence of alkaloid, xanthoprotein, steroids and cysteine.

Preliminary phytochemical screening shows the presence of tannin in higher concentration in acetone and aqueous extracts while carbohydrate in chloroform, ethanol, and methanol. Moisture content (71.33±1.07), Ash content (8.23±0.24), crude fiber (7.5±0.31) and carotenoids (2.35±0.12) contents were higher in immature seeds and Crude fat (16.13±0.3) in mature seeds. The present study is revealed that chemical constituents present in various seed extracts which have biological activity. Proximate and antioxidant analysis shows the nutritional potential of seed of *B. variegata* L.

O-T_4-2:Preliminary phytochemical evaluation of some *Curcuma* species (Zingiberaceae)

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In *Ayurveda* and Indian traditional system of medicine, various plants or plant parts were utilized in the treatment of different kinds of human diseases. Now a day's people are again relaying on herbal drug as long consumption of it's not cause any side effect compare to allopathic drugs. Plants are the rich source of various secondary metabolites which make them able to found potent and activeagainst diseases. Hence screening of phytochemical constituents and bio-prospecting approach has immense importance to evaluate active principles in them. In the present study attempts were made to investigate preliminary phytochemical constituents from the methanolic crude extract of rhizomes of *Curcuma zedoaria* (Christm.) Roscoe, *Curcuma scaposa*(Nimmo) Skornick.& M. Sabu and *Curcuma pseudomontana* J. Grahm. The results showed presence of alkaloids, Carbohydrate, glycosides, flavonoid, proteins, starch, steroids, tannins, saponin, terpenoids, phenols and phytosterol.

O-T_4-3:Bioprospecting of threatened plants of Eastern Ghats of India: Adding value to biological diversity

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Bioprospecting is the process of discovery and commercialization of new products from biological resources and has a direct link to the conservation of biodiversity and benefit of local communities. Like any other plants, threatened species could also be sources of new phytochemicals, food supplements, anti-oxidants and genes for development of new drugs or for genetic improvement of plants. However, threatened plants are represented by small populations and numbers and are poorly studied in respect of their utilitarian values and commercial potential.

In the present study, the bioprospecting of three endemic and threatened plant species of Eastern Ghats of India namely, *Lasiococcacomberi*, *Hypericumgaitii* and *Cycassphaerica* has been undertaken. Physico-chemical analysis of seeds of *Lasiococcacomberi* revealed that it has high protein (13.78%), crude fiber (22.2%) and carbohydrate (11.54%) contents. The seed oil contains high amount of polyunsaturated fatty acids especially linolenic acid (65.3%) and has great potential for use in food and nutraceutical industries.

The essential oil from tender parts of *Hypericumgaitii* was found to be a rich source of sesquiterpene and monoterpene hydrocarbons with *α*-pinene (69.5%) and *β*-caryophyllene (10.5%) as the predominant constituents besides possessing moderate antioxidant property. The plant is also identified as a new source of pseudohypericin.

The endosperm of *Cycassphaerica* had high contents of carbohydrate, fatty acids, fibre, vitamin B1 and C, essential amino acids such as leucine, threonine and lysine. As many as 20 phytochemicals were isolated from the endosperm, out of which ethyl-α-D-glucopyrinoside, 3-0-methyl-D-glucose and cis-vaccenic acid, palmitic acid, γ-sitosterol were the important compounds.

The bioprospecting of these threatened plant species will add to the conservation value of the species, promote cultivation on commercial basis and in turn bring the species out of threatened category.

O-T_4-4:Comparative study of Anti-microbial activity of *Gymnema* R. Br. Complex

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A number of plants are claimed to possess anti-diabetic properties in the traditional system and extensively used by tribal people as well as local inhabitants. Out of these 'Gud-mar' is one of the groups. Ethno-botanical data revealed that, in Maharashtra, *Gymnemasylvestre* (Retz.) R.Br. ex Sm., *G. cuspidatum* (Thunb.)Kuntze.,*G. khandalense*Sant., *G. montanum* Hook. f. and *Ichnocarpusfrutescens* (L.) W.T. Aiton. are called Gud-Mar and used as anti-diabetic plants. Beside the anti-diabetic property the drugs are tested for antimicrobial activity using Ethnanolic extract. These extracts were tested against strains of both, Gram positive (*Staphyllococcusaurea*, *Streptococcus pneumoniae*) and Gram negative (*Escherichia coli* and *Proteus merabilis*) and fungi (*Aspergillusniger* and *Penicillium* sp.) by well diffusion Method. The results are promising for most of the species under study.

O-T_4-5:Development of shoot and callus cultures in *Portulacaoleracea* Linn. with their fatty acid profiling

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Regeneration of in vitro shoots and callus cultures were initiated from leaf explants of *Portulacaoleracea* onMurashige and Skoog's (MS) medium fortified with different plant growth regulators. Optimum number of shoots (8.3±1.01)was achieved on 5 µM N^6-benzyladenine (BA)and 10 µM N^6- furfurylaminopurine (Kin) after 6 weeks. Transferring the shoots to MS basal medium supplemented with 5% coconut water enhanced the number to 36.2±3.70 within 2 weeks. Callus cultures were also developed on MS medium supplemented with 2.5 µM BA and 2.5µM 2,4Dichlorophenoxy acetic acid (2,4-D) and optimum fresh weight (20.2±0.70 grams) dry weight (0.628±0.04 grams) was obtained after 8 weeks. Fatty acid profiling of the in vivo shoots, in vitro shoots and callus revealed that palmatic, linoleic and linolenic acid were the major fatty acids in all the samples. Odd chain fatty acids such as the Heptadecanoic acid (C17:0) and Tricosanoic acid (C23:0) were only detected in callus cultures.Thus *P oleracea* has an efficient regeneration potential and is capable of synthesising long chain fatty acids in cultures.

O-T_4-6:Phytochemical study of some species of Genus *Grewia* L from Western Maharashtra

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Genus *Grewia* L. belongs to family Tiliaceae which accounts about 690 species from Tropical Africa and Madagascar, Himalaya, Arabia, Pakistan, India, China, Malesia and Northern Australia. About 33 species were found in India (Sharma et.al. 1993; Santhoshkumar et.al., 2001; Manicum and Murgan, 2006) and 21 species in Maharashtra however in Western Maharashtra recognized about 11 species (Almeida, 1996; Cooke, 1901; Singh and Karthikeyan, 2000; Yadav&Sardesai, 2002)Even though *Grewia* L. is one of the genus which shows various Ethano-medically useful and it has various medicinal properties with diverse chemicals but a little work on biological activity and phyto-chemistry has been done. Therefore present work has been undertaken to find out new entity or new activity responsible for various therapeutic activities.

Out of the 13 species of genus *Grewia* L considered for present field survey of Western Maharashtra, we have selected 10 species for phyto-chemical analysis (Physical and chemical test) which are as follows *Grewiaabutilifolia*Vent.ex A. Juss., *G.asiatica*L., *G.damine*Gaertn., *G.flavescence*A. Juss., *G.nervosa*(Lour.) Panigr.,*G. orbiculata*Rottl., *G.serrulata*DC., *G.tenax*(Forssk.) Fiori.,*G.tiliifolia*Vahl. and*G.villosa*Willd.The comparative profile of different physical and chemical test carried out from leaf powder samples of selected plant specimenssuch as reducing sugar, non reducing sugar, dry matter content, Nitrogen, Protein, Fat, crude fibers, Carbohydrates, Cellulose, etc.

O-T_4-7:Assessment of Nutraceutical Potential of*Tribulus terrestris* L.: A less known edible

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*Tribulusterrestris*L. (zygophyllaceae) is widely distributed herb along a wide geographic area; commonly known as Gokharu or DonshingiGokhru. It has long been used in traditional medicine for different ailments of central nervous system, uronogenital and gastrointestinal disorder, impotency and general weakness as it possesses astringent, demulcent, diuretic, emollient, cooling, anti-inflammatory and

aphrodisiac properties.During the documentation of wild edibles from North Maharashtra leaves and fruits of plant were found to be utilized as edible. Leaves of plant are made into vegetable while fruits used to prepared *'Ladoo'*. Edible Potential of the leaf was assessed by estimating nutritional and medicinal constituents. Estimation of primary nutrients (Lipids, Crude fat, Carbohydrates, Proteins, fibres), vitamins (ascorbic acids and carotenoids) and antioxidants (Lycopene, anthocyanin and simple phenolics) was done. Minerals were estimated in terms of ash yield. Ash was analyzed qualitatively and quantitatively for its mineral constituents. Material was also screened for the presence of bioactive molecules to understand medicinal potential. Assessment shows they are good source of antioxidant, vitamins and minerals.

O-T_4-8:Phytochemical analysis, antioxidant activity and estimation of cardiac glycoside (bufadienolide) from *Drimia* species (Hyacinthaceae)

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Indian Squill (*Drimia*Jacq.) is bulbous geophyte belonging to the family HyacinthaceaeBatsch ex Borkh. and well known for its medicinal values. Eight species (each leaf and bulb samples) of *Drimia* were analysed for phytochemical content of dichloromethane, methanol and water extracts (total phenolics, total flavonoids, total tannin and Antioxidant activities). Methanolic bulb extract of DI3 showed maximum TPC (22.19 ± 1.00 mg GAE/g DW). The higher TFC was recorded in methanolic extract of bulbs of DRAO (58.65 ± 1.95 mg QE/g DW). While, significantly maximum TTC (857.17 ± 38.62 mg GAE /g DW) was found in methanolic bulb extract of DRAZ. DPPH radical scavenging activity was highest in DCM bulb extract of DC (12.22 ± 1.16 %). While, DCM extract of bulbs of DP (64.26 ± 2.96 %) showed greatest ABTS radical scavenging activity. Phosphomolybdenum reduction potential was highest in methanolic leaf extract of DI3 (52.86 ± 0.20 mg AAE/g DW). According to overall study, leaf extract of DI2 (*Drimiaindica* diploid) showed considerable antioxidant potential with higher level of TFC and TTC.Cardiac glycosides (bufadienolides) from eight bulb genotypes of

Drimia were estimated by spectroscopy and RP-HPLC. Spectroscopic estimation revealed highest cardiac glycoside (scillarenA equivalent) content in DCM extract of bulbs of *Drimiacoromandeliana* (32.57 ± 0.27 mg SCE/g DW) and followed by *D. indica* diploid (14.70 ± 0.60 mg SCE/g DW). Same results were confirmed by RP-HPLC analysis. It is the first comparative chemical profiling of bulbs of Indian *Drimia* spp. using HR-LCMS analysis.

O-T_4-9:Nutritional, techno-functional, polyphenolic profile and antioxidant properties of flours obtained from *Cassia tora* seeds

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The present study investigates the proximate, minerals, anti-nutritional factors functional properties, phenolic profiling and antioxidant activity of seed flour of *Cassia tora*L. The results of proximate composition in % were as follows: moisture 12.60, protein 22.92, crude fibre 6.97, fat 5.9, ash 4.29, and carbohydrate 24.51. The mineral composition of the seed showed N, P, K, Ca, Na and Mg in % were to be 4.02, 1.86, 0.97, 0.33, 0.11, and 0.07 respectively while other elements determined were Fe and Zn with 0.01 and 0.004. The anti-nutritional factors analyzed were oxalate (26.40µg/mg), phytic acid (1.80µg/mg), saponin (8.0µg/mg), tannin (11.68µg/mg) and condensed tannin (0.01µg/mg). For physicochemical and functional properties, acacia seeds flour had excellent water holding index, swelling index, foaming capacity and foam stability. Moreover, the seed flour with different solvent extracts possesses dose-dependent antioxidant activity. Furthermore, the phenolic compositions of seeds were determined by HPLC, revealed six phenolic compounds namely rutin (58.60µg/mg), quercetin (7.22µg/mg), benzoic acid (2.85µg/mg), cinnamic acid (0.30µg/mg), syringic acid (118.38µg/mg) and salicylic acid (48.11µg/mg). Therefore based on the present study the Seeds of *C. tora* are with good nutritional components and could be of great use in the preparation of functional foods and dietary supplements.

O-T_4-10:Ethno-botanical studies of Thane, Murbad, Raigad and Ratnagiri districts of Maharashtra

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Ethno-botanically Thane, Murbad, Raigad and Ratnagiri districts of Maharashtra are very rich. The tribals of these districts are treasure trove for indigenous traditional knowledge and they are associated with tropical moist and dry deciduous vegetation. The tribe's viz. Thakur, Warli, Mahadeokoli, Katkari and Kokna are majorly associated with the forests in this region and mainly depend on the forest for their livelihood. During the investigation, ethno-botanical information of total 346 plant species used by tribals and rural peoples have recorded. Out of these 48 species are distributed among 42 genera and 18 different families belonging to monocotyledons and 295 species are included under 236 genera of 83 families belonging to dicotyledons. Traditional knowledge of 3 Pteridophytes is documented during study.
Total 584 uses are recorded, out of which 350 are categorized under medicinal uses and 234 are grouped under other economic uses, in which 116 are recorded for food, 33 for fodder, 14 for fish poison, 5 for spices, 6 for dyes and 60 other miscellaneous. 49 species are used as veterinary medicines and ethnic peoples majorly they uses these plants for curing different ailments like diarrhea, fever, fracture, indigestion, skin diseases, foot and mouth diseases, etc. In the study area 39 species are used as wild vegetables, some are screened for their nutraceuticals contents and are rich in proteins, lipids, crude fibers, carbohydrates and Vitamin'C'.
List of NTFPs viz. natural dyes, gums, resins, wild edibles, natural fibers, tans, medicinal and aromatic plants, TBOs, bead seeds, fodders, and botanical pesticides was prepared with their frequency, distribution, and traditional uses.

O-T_4-11:Study of morphological and Phytochemical analysis of some Medicinal Plants of Talod Taluka, North Gujarat, India

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This study was undertaken with the aim of analysing some morphological parameters and screening of important phytochemical compounds. Most probably herbal plants used in traditional medicinal consist of wide range of bioactive compounds that can be used as alternative therapeutic tools for the prevention or treatment of many contagious diseases. Phytochemicals have two categories i.e. Primary and secondary constituents. Primary constituents have chlorophyll, proteins, sugars and amino acids. Secondary constituents contain Terpenoids and Alkaloids. Medicinal plants have anti-fungal, anti-bacterial and anti-inflammationactivities. The present study involves five different medicinal plants Mangifera indica, Madhuka indica, Manilkara zapota, Manilkara hexandra, Annona squamosa available in Talod Taluka. Morphological assessment of five plant showed significant difference in leaf and flower attributes including its colour and length in fresh form. The aqueous extract of leaf samples was used for the phytochemical constituents in the plants. The result of the phytochemical analysis of these medicinal plants showed that the terpenoids, phlobatannins, reducing sugar, flavonoids, steroids and alkaloids were found to be present in afore mentioned plants.

O-T_4-12: Ethnobotanical Knowledge of Malayali Tribes of Chitteri Hills, Eastern Ghats ofTamil Nadu, India

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Ethnobotany, the study of utility of plants and plant sources by aboriginal people, has avital role in describing traditional knowledge of plants. The main aim of the present study isdocumenting the identification knowledge of plants of Malayali tribes of Chitteri hills, EasternGhats of Tamil Nadu, India. It reveals from field visits that Malayali tribal people of Chitterihills use 320 plant species for their day-to-day among this they identify about 135 speciesbelongs to 105 genera under 46 families. Malayali tribes use morphological characters such asbark surface, leaf colour, leaf taste and exudates, and ecology of species as criteria foridentification. They used 19 underground plant parts belonging to 16 genera under 15 families.

Of these, 19 species, 5 are used as food, the rest are used for medicinal properties. It is concluded from the present study that documenting the knowledge of identification

of plants of Chitterihills is to be accorded top priority in the preservation of our ancient traditional knowledge.

O-T_4-13: Quantitative Assessment of selected Medicinal Plants used in and around the TapkeshwariHill Range Landscape, Bhuj-Kachchh district of the Gujarat State

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Tapkeshwari Hill Range (THR) is a hilly tract located close to Bhuj city- district headquarter (7 kms.) and provides high diversity of floral species in various vegetation types or habitats i. e. *Euphorbia* Scrub, *Prosopis* scrub, Thorn Mixed Scrub, Open Scrub, Thorn Mixed Forest, *Acacia senegal* Forest, *A. nilotica* Forest and Salvadora Mixed. Traditional knowledge on medicinalplants was collected from villagers in and around the THR through questionnaire survey using anopen-ended questionnaire datasheet, which was used while interviewing local villagers includingMaldharies (pastoralists) and farmers. The study involved the use of both key informants andlocal people. The questionnaire survey and focus group discussion aimed at gatheringinformation on present and past status of medicinal plants and their traditional uses.Total 383 villagers were interviewed from 7 villages and 2 hamlets (locally called Wandh), ofwhich 202 (52.74%) and 76 (19.84%) were maldharies and farmer communities respectively,
while rests of the respondents (105 individuals and 27.42%) were either maldharies oragriculture laborers. Based on information generated, we identified the potential forestpatches/areas within the THR for intensive survey of selected medicinal plants (38 species). Thetop five medicinal species with high RF% were *Boerhavia diffusa* (14.71%), Com*miphora wightii* (10.11%), *Grewia tenax* (7.45%), *Pentatropis spiralis* (6.11%) and *Balanites aegyptiaca* (4.70%)in study area. Comparison of relative density among the species showed, that *Boerhavia diffusa*(1345 plants/ha), *Fagonia schweienfurthii* (1041 plants/ha), *Solanum surattense* (621plants/ha), *Grewia tenax* (455 plants/ha) and *Achyranthesaspera* var. *argentea* (393 plants/ha)were dominated as top five species.

O-T_4-14: Pollination efficiency, syndrome of Indian Honey bees, Apis cerana indica inCoccinia grandis (L.) Voigt (Cucurbitaceae)

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Plants attract pollinators by different ways and floral nectar is one of the rewards, thatkeep pollinators moving pollen from one plant to another and floral scent provides honest signalsthat advertise the occurrence of rewards, both provides fitness benefit for plants. The varioustraits exhibit by flowers for favoring a particular method of pollination is collectively known aspollinator syndrome. The present study were carried out to identify the pollination syndromeexhibited by *Coccinia grandis*; adioecious species with heteromorphic sex determination systembelonging to the family Cucurbitaceae. The study identified the species of *Apis* viz, *A.cerana indica* and *A.dorsata* as the pollinators in the candidate species, of these, *A.cerana indica* act wasthe most frequent visitor. The study found out that, pollination reward for male plant is the pollengrains, while that was floral nectar in the female. Bee foraging vary according to the changes innutrient resources like pollen and nectar. The nutritional analysis revealed that the pollen grainsof the C.grandis were the rich source of carbohydrates (38%), lipids (45%) and proteins(58.6%).
The GC-MS analysis of nectar identified 23 volatile compounds and whose functions rangingfrom pollinator attraction to protection from pathogens and including flavour compounds, sugardegradation products etc. Aromatic compounds like furaneol were functions as olfactory cues inthe nectar guide pollinators; potentially promoting a mutualistic interaction between plant andpollinators in this species.

O-T_4-15: Ethnobotanical Survey and Wild Edibles of Wan WildlifeSanctuary

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The Wan Wildlife Sanctuary is situated in Akot Wildlife Division, Akot of Akoladistrict, Maharashtra which contributes 211 sq. km area of Melghat Tiger Reserve. It liesbetween the longitudes 21°11’20"E to 21°10’47"E and

latitudes of 76°46'00"N to 77°05'00"N. An area of 205.86 sq km is actual forest area and 5.14 sq km. area is of cultivationand 'Gaothan' area of seven ex-forest villages called as 'Medow'. Present survey work has been undertaken during 2016 – 2018. During the surveyperiod the only village present in the wildlife sanctuary area was 'Talai'. During this surveywork altogether ethno-botanical data of 44 plants belongs to 26 families and data of 60 wildedible plants have been collected from 'Rathi' & 'Korku' communities which are the majorcommunities residing in the Wildlife Sanctuary area. However Rathi's are more in number ascompared to Korku's. Both of these communities are mainly dependent on forests for earningtheir livelihood. The present data have been also collected from local forest field workers ofwildlife sanctuary area. These wild edibles were used by local communities or by local forestworkers as fruits, vegetables, etc. of which the most popular wild edible is 'Mahua'.

O-T_4-16: TLC-Direct Bioautography as a High Throughput Method for Detection of Antioxidant, Antimicrobial phytoconstituent in *Andrographis echioides* Nees. by HPTLC and LC-MS/MS

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Medicinal plants play a significant role in drug discovery for lead pharmaceutical products. One such species with extensive medicinal properties is *Andrographis echioides nees*. commonly known as 'Kadukirayatu'. It is widely distributed throughout Western and Southern part of India. The present work on this plant deals with development of Thin-layer chromatography-direct bioautography method for the identification of potential antioxidant and bioactive compounds. Thin-layer chromatography-direct bioautography (TLC-DB) method is a convenient approach for searching plant constituents with biological activity, such as antibiotics. TLC-DB is a high throughput semi-qualitative method enabling analyses of many samples in parallel. The phytochemicals from the species were extracted and tested for antibacterial activity against pathogenic strain of *Escherichia coli* using agar cup diffusion method. TLC-DB method was used to identify the bioactive antioxidant

compound. The active compound was transferred to LC-MS/MS from developed TLC silica plate for finding out molecular weight. Then it was subjected to different collision energies in LC-MS/MS system to predict the structure of the antibacterial compound. LC-MS/MS data along with FTIR spectra confirmed the principle compound is 5,8,2'-trihydroxy-7-methoxyflavone-5-O-β-D-glucopyranoside. The m/z value was found to be 462 (M+H+ -H2O). The high end hyphenated techniques i.e. Bioautography, HPTLC and LC-MSMS together provides a rapid and secure method for detection and identification of biomarker androgechoside A.

O-T_4-17: Effect of different drying methods and storage conditions on sennoside A and sennoside B in *Senna* leaves

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Senna is an important medicinal plant and is used in many Ayurvedic formulations. Sennoside A and sennoside B are the main bioactive phytochemicals present in leaves and pods of senna. The drying methods and storage conditions of senna leaves affects the bioactive phytochemicals concentration. In the present investigation, the senna leaves was dried using different methods of drying namely, sun drying, solar dryer drying and shade drying and then it was stored in polythene bags, gunny bags and plastic containers and kept them in light and dark conditions. In sun drying greenish colour of top layer of senna leaves changed to light cream colour but below it the greenish colour maintained. In solar dryer drying greenish colour is maintained till it stored in solar dryer and drying layer thickness may be kept more than shade and sun drying of senna. In shade drying greenish colour is maintained for few days but its top layer changes gradually in light cream colour. The moisture loss in drying methods used was found 69.44% to 72.22%. The data were recorded and analyzed for sennoside A and sennoside B in beginning and at the interval of three months by HPLC-PDA detection method. The presence of microbes was also analyzed. Total sennoside A and sennoside B varied from 0.23 to 0.70 percent in sun drying under different storage conditions mentioned above. It varied from 0.20 to 0.61 percent in shade drying and 0.07 to 0.52 in solar dryer drying under different storage conditions mentioned above. Based on the sennosides A and B concentration in senna leaves, sun drying or shade drying may be preferred. The plastic container for sun dried

senna leaves may be used for its storage under dark conditions and polythene or gunny bag for storage in light conditions. The same storage conditions could be used for shade dried and solar dryer dried senna leaves.

Theme 5: Phytogeography, Endemism & Threatened Plant diversity and climate change

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O-T_5 -1:Distribution of *Abutilon ramosum* (Cav.) Guill. & Perr.and *A. theophrasti* Medik. in Maharashtra, India

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The present paper reports occurrence and distribution of *Abutilon ramosum*(Cav.) Guill. &Perr.and*A.theophrasti*Medik.in the Maharashtra state. Both the species are reported as the first authentic recordfor the state.

O-T_5 -2:Endemic tree species of Kali Tiger Reserve (KTR)

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The Kali Tiger Reserve (KTR) is located in Uttara Kannada District of Karnataka state. It is one of the five Tiger reserves of Karnataka and is a part of Central Western Ghats. The total area of KTR is 1345 km^2 and is spread in parts of Haliyal, Karwar and Joidataluks. It is located between 14^0 57' and 15^0 09' North latitude to 74^0 15' and 74^0 71' East longitude. The KTR comprises of six forest ranges. The Anshi range is situated towards western side receives highest rain fall (4000-6000mm/annum) and Kulgi range is last range situated towards eastern side receives lowest rain fall (1200-2500mm/annum). In between these two ranges, adjacent to Anshi range towards eastern side is the Kumbarwada range receives little less rain fall (3000-4000mm/annum) compared to Anshi range. The Castle Rock range is situated towards North Eastern side of KTR and receives less rain fall than Anshi range (2000-3000mm/annum). Adjacent to the Kumbarwada range is the Gund range towards the eastern side of Anshi range. The rain fall in Gund range varies from 2000 to 3000mm/annum. The Phansoli range is situated towards eastern side of KTR. The annual rain fall varies between1500- 2500 mm/annum which is very less compared to Anshi range. This clearly indicates that the rain fall gradually decreases towards eastern interior side. The study showed that out of 24 endemic species recorded in KTR, the Anshi range has 20 endemic species followed by Kumbarwada with 16

endemic species, Castle rock range 14 endemic species, Gund range has 17 endemic species, Phansoli range has 13 endemic species and Kulgi range 6 endemic species. Thus the endemic species have decreased from Anshi range to Kulgi range. This clearly indicates that the endemic species decrease with decrease in rainfall.

O-T_5 -3:Lamiacean plants in southern Western Ghats: diversity and endemism

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Lamiaceae is the one of the largest dicotyledonous family having advanced gamopetalous flower and large species diversity. Lamiaceae*s.l.* constitutes 236 genera and 4000 species (Harley *et al.*, 2004) in which 70 genera and 425 species are available in India. Majority of Lamiaceaen members are hill-plants. On the Indian side, Himalayas harbor almost 200 species followed by Western Ghats with high endemism and species diversity. Due to its enormous importance, a study of diversity and endemism of Lamiacean plants in southern Western Ghats were assessed through field studies with the financial aid received from a SERB project and the results are presented here. Southern part of Western Ghats which extend from Kanyakumari to south of Goa harbor almost 162 species under 32 genera. Of this diversity, some spread beyond the limits and 45 species are found in other parts of India. There are about 30 species common to this area and Ceylon. Highest species diversity is exhibited by *Leucas*(26 spp.) followed by *Pogostemon* (23 spp.), belong to the subfamily Lamioideae whereas 12 genera possess only single species. Endemic diversity also shows this trend with highest in *Leucas* followed by *Anisochilus, Pogostemon* and *Premna*. Species diversity and endemism of all genera is assessed under three regions in Western Ghats: (1) from river Kaliei to Coorg, (2) Nilgiris and (3) the Anamalai, Palni and Cardomom hills. The data are presented in a tabular form supported by photographs and illustrations.

O-T_5 -4:Phytogeography, Endemism and Conservation of the genus *Thottea* Rottb. in Western Ghats

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The genus *Thottea*was established in 1783 by Christen FriisRottboel. It is an Indo-Malayan genus with *Thotteasiliquosa* as the type species, based on the Rheed's illustration of the plant commonly found in Malabar area of India popularly called as 'Alpam' in Malayalam. *Thottea*have been distributed in Sri Lanka, Bangladesh, Myanmar, Thailand, Indochina, China, Malaysia, Philippines and India. In India, *Thottea*inhabits in two distinct geographical areas such as Western Ghats and Andaman-Nicobar Islands.

As a phytogeographic region, W. Ghats exhibits maximum diversity and inhabits11 species of which 10 are endemic and one species extends its distribution to Sri Lanka. It is interesting to note that *T. siliquosa*, is only one species distributed throughout the W. Ghats. Southern Ghats exhibits maximum species diversity. Two species are occurring in Karnataka, five species in Tamil Nadu. Interestingly, Kerala inhabits all the 11 species of which 5 are restricted to the State. There are 3 species viz. *T. dalzellii*, *T. sasidharania* and *T. sivarajanii* are distributed towards the north of the Palghat gap whereas*T. abrahamii, T. adichilthottiana, T. barberi*and *T. idukkiana*, *T. ponmudiana* and *T. siliquosa* are seen towards the south of the gap.*T. abrahamii*and *T. barberi* are strictly distributed south of Aryankavu pass in Agasthyamala BR. *T. dutchartrei*and *T. siliquosa*have a wider distribution both at the north and south of the Palghat gap. Out of the 5 species endemic to Kerala, *T. sasidharania*and *T. sivarajanii* are restricted to the northern Kerala whereas*T. abrahamii*and *T. idukkiana* to southern Kerala and one species, *T. adichilthottiana* is reported only from Central Kerala. Phytogeography reveals that the natural segments delimited by two gaps play a critical role in species distribution. In addition to Peninsular effect, the Palghat gap also provide southern region of W. Ghats almost an island nature attributing an ecological niche of its own. The specific features of the mountain relief system, i.e. continuities and discontinuities have played a major role in manifesting and maintaining speciation and endemism. As part of conservation all the species are conserved in the *ex- situ* conservatory of JNTBGRI.

O-T_5 -5:Diversity profiling of angiosperm vegetation across topographic discontinuity of Palghat Gap in Southern Western Ghats – A case study

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The floristic analysis on species richness, endemism, taxonomic singularity and distribution of angiosperms in two forest ranges on either sides of Palghat Gap of Southern Western Ghats revealed the presence of 1610 taxawith 955 species belonging to 135 families in Kollengode forest range in south and 655 species belonging to 105 families in Olavakkode range in north of the of the Gap. Of the taxa analysed, 103 families and 302 species are common in both the ranges and the average taxonomic singularity is 0.821 in Kollengode forests while it is 0.845 in Olavakkode range. The Kollengode range harbors 216 endemic taxa while it accounts to ninetythree in Olavakkode range. Critical inquiry on the distributional status showed that eighttaxa of Olavakkode range have a strict northward distribution while nineteen species recorded in Kollengode range share its distributional range with southern ends of Western Ghats. But the frequency of habitat sharing by taxa on either sides of the gap is comparatively less and only eighteen species seems to have successfully crossed the dispersal barrier of the Gap like *Strobilantheslanatus*Nees, *Meteoromyrtuswynaadensis*(Bedd.)Gamble and *Justiciaglauca*Rottlerfrom north of Gap and *Ceropegiathwaitesii*Hook.,*Givotiamoluccana*(L.)Sreem.and*Diospyrosebenum* J. Koenig from Southern end. The results of lesser number of range sharing between the taxa highlight the influence of the gap traits acting as a barrier in the continuous distribution of the taxa.

O-T_5 -6:Wood anatomy of some endemic species of Western Ghats, India

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Wood anatomy of seven endemic species *viz*. *Cansjerarheedii* (Opiliaceae), *Erinocarpusnimmoni* (Malvaceae), *Maesa indica*, (Primulaceae), *Maoullava spicata* (Fabaceae), *Nothopodytesnimmoniana* (Stemonuraceae),*Olaximbricata* (Olacaceae), *Salaciachinensis* (Celastraceae), is investigated by histological methods. Amongst them, *E. nimmoni* and *M. spicata* are monotypic taxa while rest of them are endemic to Western Ghats. Published information on all the above mentioned taxa is either meagre or almost nil. All the members share anatomical features that are characteristic to their respective family with some additional features such as: occurrence of nucleated fibres in *Maesaindica* or presence of bordered pits in ray cells in*Salaciachinensis*. Ecologically all the species are well adapted to mesomorphic condition and show higher values of vulnerability and mesomorphy indices (1> and 800 > respectively).

O-T_5 -7:Recollection and Distribution of two rare and endemic species of genus *Themeda* (Poaceae)

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*Themedamooneyi*and *Themedasaxicola*was described by N. L. Bor (1952) from specimens collected from H. F. Mooneyi from Koraput district of Odisha state. *T. mooneyi* and *T. saxicola* are unique in genus as it has single raceme in inflorescence whereas all other species in this genus have compound panicle with more than one raceme arranged in cluster. Recently new species *Themedaodishae*Chorghe*et al.* (2016) was described which is similar to these 2 species. During field survey conducted between 2015 and 2017 species were collected and its population were

studied. The population of these two species are restricted to localities in Koraput District. Both species were collected for first time after type collection i.e. 6 decade later. The habitat in those species are distributed are under anthropogenic pressure, thus there is need for conservation efforts for these species.

O-T_5 -8:Indigenous Tree Flora of India: The Need for Consensus in arriving at the List

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According to the IUCN's Global Tree Specialist Group, *a woody plant with usually a single stem growing to a height of at least two metres, or if, multi-stemmed, then at least one vertical stem five centimetres in diameter at breast height* is a tree. An estimate of the number of tree species on our planet ranges from 45,000 to 100,000 (Fine & Ree, 2006). Ten per cent of world's total (ca. 8,000) tree species are globally threatened with extinction. As a nation, India has 2,544 tree species predominated by Lauraceae and Rubiaceae with 180 tree species each, followed by Leguminosae (131 spp.), Euphorbiaceae (113 spp.; excluding the 85 spp. of Phyllanthaceae) and Mytaceae (94 spp.). However, this tree species list is to be standardized for India through discussions and debate since there are issues of nomenclature, unresolved names, and diagnostics. Above all, to mention, the species of *Acalypha* (*A. fruticosa*), *Baliospermum, Claoxylon, Senna alexandrina* (which is at the most a shrub; introduced), *Sauropus quadrangularis* and several others are treated as tree species in the "List". This is much needed because we consider trees as a precious living non-renewable resource, integral to our culture and tradition, and yet not being kept well due to the lack of nation's political will and failure of implementation authority despite scores of existing pungent nature conservation, biodiversity, wildlife acts and laws. Besides, several exotics tress are introduced and they have become naturalized or invasive. Our tree flora fast changing, more so in the urban and semi-urban landscapes. We need to protect our indigenous tree biodiversity. We have to have a list of indigenous trees which are endemic to start with. It can be done with state-wise lists for India and then merging them for the nation. This will help to develop a policy on exotics trees to deal with.

O-T_5 -9:Impact of habitat fragmentation on loss of plant species using geospatial techniques

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Forest fragmentation has posed severe threats to biodiversity. Apart from forest degradation, it also brings about several physical and biological changes in the forest environment demonstrating intense land use changes. Information on such changes using spatial data provides a vital input for taking ameliorative measures. Present research has focused on the fragmentation that has occurred in Pavagadh region, lying in the Panchmahal District, and once considered as biodiversity hotspot. FRAGSTAT modeling when applied to forest classes exhibited a distinct decrease of fragments from 114 to 91 in 2012 but after 2012 this decrease was very less i.e from 91 to 90. A unique feature observed was reduction in fragmentation of forest areas. The forest area, after careful study, brought out positive, negative and no change during different time period. Such statistics and information help in not only understanding the conservative efforts taken by forest departments as restoration activities but also about the area which are sensitive and requiring conservation prioritization. This if not assessed can result into loss of important species like *Acacia leucophloea*, *Buchanania lanzan* which have significantly reduced as brought out in the present study. Such type of work can prove a boon for future loss of species.

O-T_5 -10:Studies on Endemic and Threatened Angiosperms of Gujarat

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Gujarat is a prime location when we look into different phytogeographical habitats. However, when we discuss about endemism and threatened species there is scattered information available on it with no detailed documentation. Very few studies are

available on endemic and threatened plant species. The existing literature on threatened plants of Gujarat is inconsistent on the threat status of the species, which may be due to biasness of the researchers in terms of threat perception or methodologies adopted. An outcome of this is that the highest number of threatened plants has been reported by Gujarat Ecology Commission (318) followed by Flora of Gujarat (230), Environmental Information System (73), Trees of Gujarat (57), International Union for Conservation of Nature (23), Distributional status survey of threatened plants of Gujarat (22), Red Data Book of Indian Plants (09), Convention on International Trade in Endangered Species of Wild Fauna and Flora (09) and Conservation Assessment and Management Plan (06). The present study deals with comprehensive threat assessments of selected 199 taxa, of which six species are strict endemic to Gujarat state, while 169 are endemic to India and occurring in Gujarat, further 24 indigenous taxa with restricted distribution in Gujarat, were also assessed. *Tephrosia jamnagarensis* is assessed as Endangered B1ab(i,ii,iv)+2ab(i,ii,iv) and published on the IUCN Red List. The most significant threat to Gujarat flora is loss of habitat to agriculture and grazing, while other threats include road-works, weed competition, industrial and urban development, changed fire regimes, collecting, mining and forestry.

Theme 1: Systematics and Phylogeny of Flowering plants

P-T_1-1: A taxonomic account on selected species of *Clerodendrum* (Verbenaceae)

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Morphology, trichome diversity, foliar epidermis structure and pollen morphology of six species of *Clerodendrum* (Verbenaceae) were studied in order to understand the usefulness of these characters for systematic treatment of studied species. Morphological similarities and differences were observed between species. Trichomes showed morphological variations in each species. Trichome diversity found in both vegetative and floral parts especially both glandular and non glandulartrichomes were found. Foliar epidermal cells are almost similar in all species with wavy walls and less broad cells. Principal stomatal types found to be anomocytic and anisocyic. At the same time, diacytic stomata are also found in one species. Pollen grains showed variation in shapes, polarity and ambitus. Moreover, exine ornamentation and colpi are found to be different among the studied species. The characters selectedin the present study found to be solid in discriminating species of *Clerodendrum.*

P-T_1-2: Novelties and additions in genus *Eleocharis* R.Br. (Cyperaceae) for India

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The genus *Eleocharis* R.Br. is widely distributed from tropical to temperate regions of both hemispheres with about 200 species. In India, the genus is reported about 21 species. Recently *Eleochariskhandwaensis, E. konkanensis, E. neglecta* and *E. wadoodii* have been described as a new species and other four taxa of *Eleocharis*have

been first time reported from India (i.e. *E. acutangula*sub.sp.*breviseta E. setifolia, E. wichurae*and*E. yunnanensis*). During our revisionary work of the genus *Eleocharis*in India, we have collected additional 4 taxa and added total 12 taxa of *Eleocharis*for country. Therefore, the present account of genus *Eleocharis* in India is 33 taxa. The present paper provides taxonomical descriptions, photoplates and brief notes on genus *Eleocharis*for India.

P-T_1-3: New species of *Impatiens* (Balsaminaceae) from Western Ghats of India

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Impatiens L. is chiefly distributed in the mountains of tropical and subtropical regions of the old world and northern temperate regions. The distribution of the genus covers 5 different diversity hotspots, viz. tropical Africa, Madagascar, southern India and Sri Lanka, the eastern Himalaya and south-East Asia. The genus *Impatiens* is represented by more than 210 taxa in India and mainly confined to the eastern Himalaya in the north and the Western Ghats in the south. According to recent estimates, more than 106 species of *Impatiens* are endemic to the Western Ghats, of which more than 80% are endangered. Very recently, three enigmatic samples of *Impatiens* were collected from different parts of Kerala. First specimen was allied to *Impatiens herbicola*Hook. f. from the wet rocky habitat in the evergreen forests in Adimali. The specimen has diagnostic pink flowers with navicular lower sepal and a prominent spur. Second specimenfrom the wet rocky habitats in the evergreen forest in Kakkayam, Kozhikode district and third from Idukki, Idukki district, which are allied to *Impatiens diversifolia*Wall.ex Wight &Arn. and*I. aliciae*C.E.C. Fisch. respectively. The former has diagnostic upright and stiff stems, axillary 2–3-flowered fascicled inflorescences and saccate lips with a straight spur; the latter has a strictly upright habit, 3–5-flowered axillary fascicled inflorescences, pink and long pedicellate flowers, and boat-shaped lips with orange blotches at the centre.

P-T_1-4: Morpho-anatomical study of some selected plant taxa of the family Cyperaceae related to their Taxonomical and Ecological Studies.

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Morpho-anatomical features of five selected plant taxa of the family Cyperaceae was studies. The investigated species are *Cyperuspangorei*, *C. Nutance*,*C. Platystylis*, *C. distance*and *Actinoscirpusgrossus*. Anatomical charecters of selected species were compared in an attempt to identify diagnostic charecters that support morphological differentiation and discovered possible relationships between the anatomical and ecological differentiation of these species. Cross sections of clums and leaves of these species were defailed examined. The following features were determined to be taxonomical studies such as cross section shape of the clum, presence or absence of vascular bundle in the clum, the diameter of mesophyll, air cavities in the stem and presence or arrangement of Bulliform cells in the leaf epidermis. Anatomical studies showed that the stems of all examine species were obtuse or acute triangular in transverse section, except for *Actinoscripus grossus* which was stellate shape , size of air cavities in stem are large in *Cyperusplatystylis*, *Cyperus distance*, *Actinoscripusgrossus*and*Cyperuspangorei*respectively. The presence of buliform cells have a significance role for taxonomic study for this expension or construction of these cells is responsible for the rolling and unrolling or folding and unfolding of leaves. Our results showed that coparative anatomy of lateral stems and main leaves may provide additional characters to be considered in taxonomical studies with in this family or genus.

P-T_1-5: Identity of *Aristolochia indica* (Aristolochiaceae) in India

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Genus *Aristolochia* L., member of family Aristolochiaceae, has been recognised with about 550 species in worldwide and by 17 species in India. Among its species in India *A. oxyphylla* and *A. lanceolata* were misidentified as *A. indica* in many cases due to its polymorphic character. Present study aims to clarify its misidentifications based on its morphological data.

P-T_1-6: Angiospermic flora & wetlands flora of Paschim Medinipur district, West Bengal, India

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Qualitative floristic surveys were carried out during 2009-2016 in the wetland ecosystem of Paschim Medinipur district, West Bengal, India. Herbarium specimens with voucher number, taxonomical and ecological information were deposited to the Vidyasagar University (VUH) herbarium. During the survey the total 160 species of angiospermic hydrophytes belonging to 45 families and 90 genera including monocots and dicots were documented. Most dominant families were Poaceae with 28 species, Cyperaceae with 23 species, followed by Hydrocharitaceae and Scrophulariaceae with 8 species, Commelinaceae, Asteraceae and Lentibulariaceae (each containing 5 species), Alismataceae, Eriocaulaceae, Fabaceae, Onagraceae and Rubiaceae (each containing 4 species). Eight families are containing 3 species, nine families containing 2 species, whereas 16 families were monospecific. Mean depth of the entire aquatic belt including ponds, streams, lakes and wetlands shrinking gradually due to severe anthropogenic activities and one type crops cultivation loses the ecosystem in crops field. There are so many species are now in endanger condition due to gradually loses of ecosystem. Conservation of wetlands including water bodies is needed to protect the micro and macrophytes.

P-T_1-7: An overview of leaf mottling, shape and habitat diversity in the genus*Ledebouria* Roth (Hyacinthaceae): complex from India

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The genus *Ledebouria* Roth belongs to the family Hyacinthaceae.Presently four species of the genus *Ledebouria* have been recorded from India.The genus has very few qualitative characters that could be used in species taxonomy. *L. viridis* S. Dutta & P. Harvey ex M.R. Almeida, *L. karnatakensis* Punekar & Lakshmin., and *L. hyderabadensis* M.V. Ramana, Prasanna & Venu are distinguished solely based on the variable characters like habit, leaf blotches and flower number therefore their distinctness from the widely spread *L. revoluta* is uncertain. *Ledebouria* exhibits high degree of multiformity in morphology, blotches on the leaves, shape and size, and flower numbers theseinsubstantial characters could be considered as an ecotypes rather than a distinct species. *Ledebouria* has a wide range of habitats like grassland, rocky crevices, plateau, slopes and plains in which they grow in gravelly soil, black soil, clayish soil and red sandy soil. We have investigated morphological variation and habitat diversity between different populations to determine the complex within the species and results are presented here.

P-T_1-8: Stem anatomy of some medicinally important member of family Chenopodiaceae

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Family Chenopodiaceae is presented by herb and small shrubs, which are annual to perennial. These families majority members are halophytes. Plant part (i.e. stem, root and seeds) is medicinally important and it is used in various Ayurvedic preparations. It contains various kind of phytochemical constituens which having medicinal properties such as anthelmintic, laxative, diuretic, anticancer, curing ophthalmia, respiratory, pain, fever, toothache, genito-urinary and tonic. It is also useful in biliousness, vata and kapha, abdominal pain and eye diseases. The present study

gives detailed anatomical information on developmental aspects of family chenopodiaceae. Anatomically, the stem is characterized by the diffuse porous xylem with indistinct growth rings and presence of successive cambia while secondary xylem is rayless in nature. Successive rings of the secondary xylem alternates with phloem embedded within parenchymatous conjunctive tissues. Vessels are mostly solitary and possess simple perforation plate on slightly oblique to transverse end walls.

P-T_1-9: Study of Stomata and Trichomes of some ethanomedicinal Plants Growing in Prantij Taluka, North Gujarat, India

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Gujarat state is not only bestowed with longest coastline, varied biogeographical zones but is also rich ethanic and cultural diversity. In Gujarat floristics more than 400 plant species are growing. Prantij taluka is a part of sabarkantha district of Gujarat state at northern zone. This taluka lies between longitude 23°-00'N and 30°-00'N latitude and 72°-5' E and 73°-5' E . In Prantij taluka Sabarmati river flows near sadoliya village, where the biodiversity is rich. In this area local people uses various plant species for different purpose. Ethanomedicinal studies have gained importance during recent years. In Prantij taluka about 198 plant species found during floristic and ethnobotanical studies before 3 years ago (Vankar et. al., 2017 and Vankar et. al., 2017). Present work deals with total 8 plant species, which are ethnomedicinally important like, snake bites, diarrhea, fever, liver disorders, warts, Bronchitis, asthma, fuel, anticancer etc. were selected for the study. All these 8 plant species were selected for the study of stomata and trichome structure. Animocytic, paracytic, diacytic types of stomata were found. Various types of trichomes are explored on vegetative as well as floral parts to evaluate their possible important. During the study of trichomes of such species, having glandular and non-glandular - simple types trichomes were observed. Out of eight species, two species having only non-glandular type, two species having only glandular type but two species having non-

glandular and glandular both type of trichomes and rest two have no trichomes. All these observations were made by proper field and laboratory techniques.

P-T_1-10: Floral anomaliesin*Alpinia calcarata* (Haw.) Roscoe

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In Zingiberaceae, androecium is represented by a single fertile stamen and usually 2-3 lobed labellum; the fertile stamen has quadrilocular anther which has a furrow into which the style fits in. The fertile stamen is present at the posterior and of the inner whorl. Recently it has been reported about the six types of abnormal flowers in *Alpinia*, *viz.* 2-stamens, 1.5-stamen, 1-stamen, stamen with only one theca, stamen absent and twin-flower. Such diversification in the number of stamen might be a recurrence of the evolutionary history of stamen in ginger families. In the present study, we observed some flowers of *Alpinia calcarata* with2 and 1.5 fertile stamens. The quadrilocular nature of anther is not seen in flowers with two stamens; moreover, 3 subulate glands occur on each flower. In addition to that the position of labellum along with two inner tepals gets altered.In case of the flower with two fertile stamens it can be hypothesized that the two anterior staminodes have now become fertile stamens, and the posterior fertile stamen reduces to a staminode. *A. calcarata* has been cultivated at the Arboretum of The M.S. University of Baroda. Photographs of the plants were taken at different time intervals with a canon 1200D camera. Inflorescences were collected and studied for the various floral characters.

Theme 2: Modern trends and techniques in Angiosperm Systematics

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P-T_2-1: Morphological and Molecular distinction of *Solena amplexicaulis* from *S. umbellata* (Cucurbitaceae)

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The genus *Solena*Lour. Was revisited and reviewed by De Wilde and Duyfjes in 2004. It is a small genus of three-to-four species. They are *Solena amplexicaulis* occurs in South India, *S. heterophylla* Subsp. *heterophylla*, *S. heterophylla* Subsp. *napaulensis* are widespread, but does not occur in S. India and *S. umbellata* occurs in S. India and Srilanka. Till the review of *Solena*, the above mentioned taxa were kept in the Indian floras and treatments of the genus under one variable umbrella species, i.e*Solenaamplexicaulis* (Lam.) Gandhi. It is monoecious, male flowers: sub umbellate, 8-20 flowered; pedicels 1-4 mm long; calyx-tube ca. 2.5 mm long. Female flowers: solitary, peduncle 1-5 mm long; filiform; ovary ovoid-oblong, apex finely rostrate, glabrous. Fruits: 1.5-2.0×1.0-1.5 cm, broadly ovoid, rostrate often 3-4 seeded. Seeds: 6-7×5-6 mm, 2-3 mm thick, grey, turgid, marginate. But *S. umbellata* can be distinguished and segregated from *S. amplexicaulis* by its dioecious condition, staminate bracts inserted above the median on the pedicels, anther-thecae curved or sigmoid, connective swollen, ovary apically not narrowed, fruit acute at apex and 9-angled 4-7× 2.0-2.5 cm, and the seeds as many as 40 per fruit, 7.0-7.5× 5.0-5.5 mm, 3.0-3.5 mm thick, discoid, slightly obovoid, , light brown, turgid, strongly margined with girdle. Due to differences in the vegetative and reproductive characters, i selected ISSR markers for the study of genetic variation in these two species available in S. India.

P-T_2-2: GC-MS Analysis of Methanol extract of Semicarpus anacardium l.f. and Buchanania lanzan Spreng Fruits.

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The aim of the present investigation is to identify important bioactive compounds from the fruits of *Semicarpus anacardium*L.f. and *Buchanania lanzan*Spreng. A methanolic extract of fruits of *Semicarpus anacardium*L.f. (Ripened) showed fifteen

and *Buchanania lanzan*Spreng (Ripened) showed twenty four chemical compounds which are identified through GC-MS analysis. In fruit of *Semicarpusanacardium*showing various compound namely as 4 methylpiperidine-1-carboxylic acid phenyl ester (11.35%), 4H-pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl (14.11%), 5- Hydroxymethylfurfural (54.13%), Tetradecanoic acid(0.61%), Octadecanoic acid (4.10%), Oleoyl chloride (0.37%). In fruit of *Buchananialanzan* shows tridemorph(6.28%),5-Acetoxymethyl-2-furaldehyde (1.04%), 5-hydroxymethylfurfural(47.80%) n-hexadecanoic acid (5.70%), 3-4Z, 7Z-Heptadeca-4, 7-dien-1yl)-phenol compound. Some of them identified compounds shows biological activity such as prevention of different diseases related to oxidative stress like antherosclerosis, inflammatory injury, cancerand cardiovascular diseases.The present study reveals that ripened fruits of *Semicarpus anacardium* L. F. and *Buchananialanzan*Sprengcontain various bioactive compounds it may be played important role in today's medicines.

P-T_2-3: Phytochemical relationships in the tribe Cypereae of Cyperaceae

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Courtosinia, *Cyperus*, *Juncellus*, *Kyllinga*, *Kyllingiella*, *Lipocarpha*, *Mariscus*, *Pycreus*, *Queenslandiella* and *Remirea* are the ten genera of the tribe Cypereae of Cyperaceae were examined from southern India to assess their phytochemical relationships and generic distinctions. Except *Lipocarpha*, all the above genera have been kept under *Cyperus* at one time or the other. Even to-day, *Courtoisinia*, *Juncellus* and *Kyllingiella* are treated under *Cyperus* whereas *Queenslandiella* finds a place within *Kyllinga*. Recently, the Cypereae is cleaved into "Cyperus clad" and "Ficinia clad" (Simpson et al., 2009). So, we need fresh and critical data supporting or contradicting the status of these genera and their placement within the tribe Cypereae or outside. The phenetic classification using the secondary metabolites of the Cypereae reveals that *Courtoisinia*, *Mariscus*, *Pycreus* and *Remirea* are all closely allied (P3 0.73) while *Queenslandiella*, *Kyllinga* and *Juncellus* are somewhat isolated from these (P4 at 0.72). *Cyperus* and *Lipocarpha* are closer (0.71) and form a distinct group P6 that joins all the other genera of Cypereae (P5) at 0.66. The results of the study are compared with the current findings on Cypereae by molecular taxonomists (Muasya et al., 2009–2014) within the "Cyperus clad".

P-T_2-4: Formation of internal phloem in *Argyreianervosa*(Burm. f.) Bojer (Convolvulaceae)

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Family Convolvulaceae is anatomically characterised by the formation of medullary (internal/intraxylary) phloem and successive cambia in majority of the species while some of the members are devoid of successive cambia. In the present study, *Argyreia nervosa* (Burm. f.)Bojer, was investigated histologically, which showed presence of medullary bundles while intraxylary (also referred as internal/medullary) phloem was found absent during the primary growth. As the secondary growth progressed further, development of internal phloem was observed on the pith margin. The marginal pith cells acquire meristematic character by repeated divisions and form radial rows of cells arranged like vascular cambium as an small segment and do not form complete cylinder. These segments were functionally unidirectional and produced only phloem derivatives centripetally. The secondary internal phloem formed by these segments were composed of sieve tube elements, companion cells and parenchyma cells. This species is also characterized by the presence of medullary bundles. Development of internal cambium and intraxylary phloem is documented herewith and possible significance of its presence is discussed in detail.

P-T_2-5: Stem anatomy of some species of Amaranthaceae

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Stems anatomy and increase in stem diameter of *Aerva javanica* (Burm.f.) Juss.ex Schult., *A. javanica* var. *bovei*Webb.,*A. lanata* (L.) Juss.,*A. monsonia* Mart., *A. sanguinolenta* (L.) Blume, *Alternantherabezvickiana* (Regel) G. Nicholson, *A. philoxeroides* (Mart.) Griseb.,*Gomphrena celosioides* Mart., *Gomphrena globosa* and *Telanthera ficoidae* Moq., was investigated by anatomical methods. Stems of all the

species showed renewal of small sectors of cambium; therefore, phloem formed on either side of these cambial segments became embedded in the secondary xylem. In older (thick) stems, complete ring of cambium is renewed; sometimes it forms an anastomosing network of successive cambia due to the renewal of larger segments of the cambium Functionally the cambium is bidirectional and exclusively composed of fusiform cambial cells. Differentiation of conducting elements of the secondary xylem and phloem remains restricted to the certain cambial cells while rest of the segments exclusively produce conjunctive cells. Accumulation of starch along with presence of nuclei in the xylem fibres even after deposition of secondary wall material is consistent in all the species. Presence of nuclei in fibres seems to be associated with absence of rays in the secondary xylem and phloem.. The significance of successive cambia, rayless xylem and nucleated xylem fibres is correlated with plant habit.

P-T_2-6: Cytological studies in the genus *Mucuna* Adans. From India

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The genus *Mucuna* is represented by 11 species and 3 varities in India out of which 4 species and one variety endemic to India. The present paper deals with the comparative cytological work in the Indian species of *Mucuna*. In present study the basic chromosome number for all Indian *Mucuna* species is n = 11 except *Mucuna gigantea* is n = 14. Fedorov 1969 has distributed the genera of Leguminosae under different basic chromosome numbers and placed *Mucuna* in basic chromosome n = 11. Earlier, only meiotic counts in *Mucuna gigantea*, *Mucuna benetti* and *Mucuna pruriens* (Sastrapradja et al.,(1974). In all the studied species SAT chromosomes were absent. The somatic chromosome number was found to be 2n = 22 in all the Indian *Mucuna* species except *Mucuna gigantea* where it was 2n = 28.The maximum total chromosome length (28.57 µm) was observed in *M. gigantea* whereas minimum total chromosome length (16.63 µm) was observed in *Mucuna pruriens* var. *hirsuta*. In the present investigation we first time reported somatic chromosome count 2n = 22 in *Mucuna yadaviana*. The karyotype of all *Mucuna* species from India was found to be symmetrical with 4a category of Stebbins (1971).

P-T_2-7: Comparative profiling of hydroxycitric acid in fruit juice of five *Garcinia* species from India

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Garcinia (Clusiaceae) is a genus of evergreen polygamus trees and shrubs comprising of about 400 species. 35 species of *Garcinia* are reported from India mainly from Western Ghats and north eastern states of India. *Garcinia* species have been commercially explored worldwide because of their medicinal values. Ethnomedically, different parts of *Garcinia* plants have been reported to exhibit many pharmacological effects. Fruits of most species in this genus are edible and are used frequently as food.*Garcinia* fruits are a rich source of hydroxycitric acid (HCA) and fruit juice has gained considerable attention as an antiobesity agent. However, comparative data on variation in HCA content in fruit juice of *Garcinia* species from India is lacking. Keeping in view of the above facts, present investigation was carried out for comparative estimation of content of HCA in fruit juice of five *Garcinia* species from India using a HPLC-PDA method.

Mature fresh fruits of *Garcinia*species namely *G. cambogia*,*G. cowa*, *G. indica*, *G. pedunculata* and *G. xanthochymus* were collected. Fruits were compressed to get the juice. HCA content in fruit juice was estimated using HPLC-PDA method. The mobile phase consisted of 0.1 % TFA in water (solvent A) and 0.1 % TFA in acetonitrile (solvent B). Separation was achieved on a Sunfire C_{18} (4.6 × 250 mm,

5µm, Waters) column in a gradient elution mode with a flow rate of 0.8 ml/min.The peak of HC eluted at 4.31 minute. Identity of the HCA peak in fruit juice of *Garcinia* species were confirmed by matching the retention time, PDA spectra (at wavelength 210 nm) and spiking studies. Wide variation in content of HCA was recorded among the five *Garcinia* species.

P-T_2-8: Towards a molecular phylogenetic studies of the *Heydotis-Oldenlandia* complex in Peninsular India

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Heydotis L. and *Oldenlandia* L. are two of the largest genera within the family Rubiaceae. They are very similar and share herbaceous or shrubby habit. Flowers are relatively small and four-merous. Stigma is bilobed and capsular fruits are usually two celled with few to many small seeds. These two genera comprise more than 500 species occurring throughout tropical and subtropical regions worldwide. In India, *Hedyotis* is represented by 74 species and *Oldenlandia* by 27 species and their circumscription are highly debated. Taxonomic delimitations within this group have been complicated by highly variable morphological characters. The present work aims to undertake a phylogenetic study of this complex in India with an aim to circumscribe taxon boundaries within this complex and to study the course of evolution of this complex in peninsular India. We use fresh specimens collected from different parts of India and use conventional extraction and sequencing methods to generate sequences. Available sequences of related taxa will be downloaded from genbank and complete a phylogenetic study using ML and Bayesian methods.

P-T_2-9: Role of metacaspases in stress responses in *Solanum lycopersicum*L.

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Metacaspases are cysteine proteases andare distantly related to animal caspases. In plants, metacapases are emerged as one of the candidates regulating developmental and stress induced cell death. Using bioinformatics tools we have identified eight metacaspases in tomato (*Solanum lycopersicum*L.) genome. On the basis of sequence homology and domain structure these metacaspases are divided into two types, type I and type II.Phylogenetic analysis showed that most of the tomato metacaspase genes were cluster with specific *Arabidopsis thaliana* metacaspases to form many distinct homologous gene clusters. Genes in such clusters likely to share common evolutionary history that has its origins in an ancestral metacaspase gene that existed before the divergence of both the plant species from their common ancestor. To reflect such relationship, we proposed a new phylogenetic nomenclature of metacaspases in *S. lycopersicum* so as to align with the established nomenclature of *A. thaliana*.

To understand the role of metacaspases during stress in tomato, a range of stress conditions were setup and their effects on expression of these genes were analyzed. Effects of drought, heat, flood, cold, UV-C, salinity, Methyl viologen (MV), Mannitol, Rose Bengal (RB), and Fumon is in B1(FB1) on expression of metacaspases was analysed using quantitative RT PCR. The results showed that some of the metacaspases were differentially expressed in stress conditions. Most significantly the expression of SolycMC1 was up regulated in cold, heat and drought. Whereas expression of SolycMC1-like1was highly up regulated in UV-C and flood. SolycMC3expression was up regulated in both flood. UV-C and drought. In case of type II metacaspases, expression of SolycMC4 was upregulated in flood and drought. In addition, very high expression of SolycMC4 was also observed in methyl viologen treatment. Another type II metacaspase, SolycMC9 showed high expression in flood and wounding.

We are further characterizing the some of the differentially expressed candidatemeta caspases in various stress conditions using molecular genetic and biochemical based approaches to know their precise role in stress regulation in tomato.

P-T_2-10: Diversity and phylogeny of metacaspase family in land plants

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Metacaspases are distant relatives of animal caspases and are known to regulate programmed cell death in plants, algae, fungi and protista. In plants, based on the domain strcuture, metacaspases are divided into two types, type I and type II. Type I metacaspases have N-terminal proline rich repeat domain and also a zinc finger domain which is absent in type II metacaspases. Italso has a linker region flanked by catalytic domains of p20and p10.

Despite the factthat we know very little about the roles of metacaspases in plants, molecular evidences suggested that type I represents the ancient form of the metacaspase, whereas the evolution of type II metacaspase had happened before the emergence of multicellular plants from their unicellular photosynthetic progenitors. Distribution pattern and molecular analysis of candidate metacaspases from several important members of green plants clade viridiplantae and cyanobacteria revealed that evolution of metacaspases in land plants depends upon gene duplication events; reorganization of domain structure and also horizontal gene transfer. These mechanisms might have played important roles in the evolution and diversity of metacaspases in land plants.

P-T_2-11: Touch induced alterations of physiological processes in *Cajanus cajan*

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The perception of mechanical stress makes plant more sensitive to environmental changes. Plants sense touch as a mechanical stress stimulus and raise a response similar to defense response. In present study we have studied effect of touch on different physiological processes of *C. cajan*. Mechanical stress immediately trigged production of reactive oxygen species in leaves. Regular mechanical stress treatment suppressed plant shoot growth while the root growth remained unaffected. Interestingly, mechanical stress altered chlorophyll composition without affecting the total chlorophyll content of leaves. However, further molecular studies are required to understand the cellular responses triggered after mechanical stress in *C. cajan*.

P-T_2-12: Micropropagation in *Eclipta alba*(L.) Hassk.

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Eclipta alba(L.) Hassk.is an important medicinal plants of India and nodes were utilized for shoot culture establishment in the present study. Murashige and Skoog's (MS) medium supplemented with different concentrations of BA/Kn individually and in combination with IAA was used. Optimum regeneration with 18.40±0.84 shoots (100% response) was achieved when placed in medium having combination of BA (10 µM) with IAA (1 µM). *In vitro* shoots were rooted in liquid/static medium as well as in natural planting substrates, and ½MS liquid medium fortified with IBA (8 µM) induced 40.50±1.38 roots (100% response). The plantlets were successfully hardened under greenhouse conditions.

P-T_2-13: Developing a Tree Information Management Systems (TIMS): An important tool in managing the trees of the main campus of The Maharaja Sayajirao University of Baroda

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Trees are an important component of urban environment and the plantation of trees is a common feature of urban areas. Urbanization has led to the removal of a large number of trees in the native landscape resulting in deforestation and fragmentation and hence Urban planners and managers give a lot of emphasis to plantation and proper management of trees. Trees provide a large number of economic, health, social and aesthetic benefits and hence their proper management is essential. Tree Management Information Systems are a set of tools including GIS and IT which help manage this important resource. A small module of TIMS was implemented for the main campus of The Maharaja Sayajirao University of Baroda to understand the different technical and scientific issues involved in developing the system. The module also helped evaluate the benefits of TIMS for managing trees in the management of trees by the university. The current article discusses the issues

involved in developing a TIMS in an open source environment using QGIS and discusses its benefits in the management of trees in the campus.

P-T_2-14: Formation of intraxylary phloem in members of Combretaceae occurring in Gujarat state

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Stem anatomy of self supporting (trees) and non-self-supporting (climbers/lianas/twiners) genera of the family Combretaceae occurring in Gujarat state were investigated for the development of intraxylary phloem. All the species investigated in the present study showed presence of intraxylary phloem at the periphery of the pith. Intraxylary protophloem began to differentiate simulataneously with the regular protophloem in 3-5th internode in the apical meristem. As the growth progressed further, distinct pateches of it were observed in 7-9th internode. With the initiation of secondary growth, additional phleome elements were differentiated from the marginal pith cell. As the secondary growth progressed further, non-self-supporting species showed development of internal cambium at the pith margin, which produces addtiotional intraxylary secondary phloem. Intraxylary phloem was composed of sieve elements, companion cells and parenchyma. Development of internal cambium and intraxylary phloem is documented herewith and possible significance of its presence is discussed in detail.

Theme 3: Biodiversity and Conservation assessment of Flowering plants

P-T_3-1: Floristic diversity of woody species of Nagarjuna Sagar forest divison of Telangana State

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The Nagarjuna sagar divison located in the Southren part of Telangana. It lies in 160 09' 45" and 160 55' 04" N latitude and 780 51' 04" and 780 31' 12" E longitude. The geographical area of this division is 2323.46 Km2. Phyto-sociological study was conducted in the study site by applying quadrat method (Mishra 1968, Sharma 2003). Quadrat of 31.6X31.6m was laid out for tree species at randomly in study site. Two Nested quadrats with size of 5X5m for saplings, 1X1m for seedlings were used. In each quadrat, data on number of individual plants, height and diameter was noted for analyzing the quantitative measures such as frequency and density.Sixteen species of trees belongs to Eleven different families were noticed in study site. *Chloroxylon swietenia* Dc.(Meliaceae) was most frequent and dominant tree species with a density of 93/ha followed by *Albizia amara*(Roxb.) Boiv.(Mimosoidae) *Acacia chundra*(Rottl.)Willd.(Mimosoidae), *Wrightia tinctoria* R.Br.(Apocyneceae),*Diospyros melanoxylon* Roxb. (Ebenaceae) whose population was 18, 16, 12,7/ha.respectively. Ten species of saplings were noticed, *Albizia amara* (Roxb.)Boiv. (Mimosoidae) formed the main saplings as its population was 10/ha. Chloroxylon swietenia Dc.(Meliaceae), Grewia tiliaefiolia Vahal.(Tiliaceae), Mundulea sericea (Willd.) (Fabaceae), *Acacia chundra* (Rottl.)Willd.(Mimosoidae) were the other species whose population was 10,8,6,3/ha respectively. Seven species of seedlings were noticed. *Chloroxylon swietenia* Dc.(Meliaceae) formed the main seedling as its population was 5/ha, followed by *Albizia amara*(Roxb.)Boiv. (Mimosoidae) *Grewia tiliaefolia* Vahal.(Tiliaceae), *Acacia chundra* (Rottl.)Willd.(Mimosoidae), *Grewia damine* Gaertn. (Tiliaceae) whose population was 4,4,3,2/ha respectively.

P-T_3-2:Invasive Alien Flora of Muktainagar Forest Area of Maharashtra

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Comprehensive studies of Alien species were done in Forest area of Muktainagar, Jalgaon district of Maharashtra. Like many other parts, alien species are also introduced in this area which affects the biodiversity of native species. The present study attempts to catalogue the invasive alien species in the forest area with reference to their habit, family and nativity. A total 60 genera under 22 families are recorded in this region. Among these about 79.31% species are invasive and about 26.08% have been introduced from Tropical, North and South America, followed by 15.21% from Tropical Africa.

P-T_3-3:*Lomatogonium* A. Braun (Gentianaceae) of Sikkim Himalaya

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The genus *Lomatogonium* A. Braun of the family Gentianaceae is with 24 species worldwide. Most of the members are restricted to the temperate and alpine regions. In India, the genus is credited with 12 species and chiefly found in the Himalayan belt. Both the Western and Eastern Himalaya are equally rich in species concentration. Sikkim with nine species is one of the native places of the members of the genus. Recently *Lomatogonium cherukurianum* S. K. Dey & D. Maity has been described from alpine pasture of Sikkim Himalaya. Taxonomy along with distributional pattern, phenology and habitat ecology of the Sikkim Himalayan members is discussed.

P-T_3-4: Floristic diversity of woody species of Atchampet forest section of Guntur forest division of A.P

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Atchampet forest section is located in the northern part of Guntur forest range of Guntur forest division of Andhra Pradesh. It consists of three beats namely Atchmpet,Tsallagariga,Chintapalli. It lies in 160.18' N latitude and 800.29' E longitude and spreads over 10,862 ha.Phyto-sociological study was conducted in the study site by applying quadrat method (Mishra 1968, Sharma 2003). Quadrats of 31.6

X 31.6m were laid out for tree species at randomly in study site. Two Nested quadrats with size of 3X3m for saplings, 1X1m for seedlings were used. In each quadrat data on number of individual plants, height and diameter were noted for analyzing the quantitative measures such as frequency and density. 21 species of trees belongs to 20 different families were noticed in study site. *Albizia amara* (Roxb.)Boiv. (Mimosoidae) was most frequent and dominant tree species with a density of 58/ha followed by *Chloroxylon swietenia* Dc.(Meliaceae), *Grewia tiliiIfiolia* Vahal. (Tiliaceae), *Manilikara hexandra*(Roxb).Dubard.(Sapotaceae), *Azadiracta indica* Juss. (Meliaceae), whose population was 43, 35, 10, 8/ha respectively.10 species of saplings were noticed. *Albizia amara* (Roxb.)Boiv. (Mimosoidae) formed the main sapling as its population was 13/ha. *Chloroxylon swietenia* Dc.(Meliaceae), *Grewia tiliifiolia* Vahal.(Tiliaceae), *Mundulea sericea* (Willd.) (Fabaceae), *Strychnos nux-vomica* (Loganiaceae) were the other top four species whose population was 8, 4, 4, 2/ha respectively. 10 species of seedlings were noticed. *Albiziaamara* (Roxb.)Boiv. (Mimosoidae), formed the main seedling as its population was 6/ha, followed by *Grewia tiliifiolia* Vahal. (Tiliaceae), *Chloroxylon swietenia* Dc. (Meliaceae), *Mundulea sericea* (Willd.)(Fabaceae), *Strychnos nux-vomica* (Loganiaceae) whose population was 4, 3, 1, 1/ha respectively.

P-T$_3$-5: Noteworthy records of Flowering plants in North Gujarat Region, India

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A floristic exploration was undertaken during the year 2013-2018 to record the interesting Angiosperm taxa in the forests of North Gujarat Region (NGR). The NGRis a semi-arid climatically withmainly tropical dry deciduous forests harboring a rich flora and vast natural resources. The authors have recorded some noteworthy plant species from various locations in the region, whichwere not reported yet in the floristic documentationsof theregion. These plants are botanically very interesting with respect to their status of rarity, narrow distribution range as well as endemism and also for medicinal purposes. The present study deals with records of 24 noteworthy taxa belonging to 18 Angiosperm families. These are described here with

brief description with updated nomenclature, notes on distribution, coordinates and phenology for better understanding.

P-T_3-6: Aquatic Plant diversity in Vadodara District

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Aquatic plants grow in waterlogged pond area.These plant species have adaptations of water and microscopic to macro habit structure.When water level is high in pond, Hydrophytes are found in the area. On the basis of their contact with soil,water and air the hydrophytes can mainly be grouped into eight life forms classes after Arber (1920) and Welch (1935) these areFloating Hydrophytes , Submerged Hydrophytesand Amphibious.A study was conducted for the diversity of hydrophytes in district Vadodara of Gujarat.The current research reports biodiversity of 10 ponds viz.Vadhavana lake and water bodies, Harnitalav, Gotri lake, Chhani lake,Samatalav,Bapodtalav, Kamala talav, Gorva lake,Bhayli lake and Vasna village lake during 2017-18. In Vadodara and surroundings 123 Species belonging to 114 Genera and 50 Families were found in which maximum diversity was reported in Vadhavanda lake and water bodies (81Species) followed by Bhayli lake (40 Species), Chhani lake (36), Samatalav (34), Bapodtalav (29), Gotri lake (25), Vasna village lake (21), Harnitalav (20), Kamala talav (10), Gorva lake (7). The total plant species with their botanical name, family and Habit is presented.Also current status of pond is showed which could help to understand the biodiversity loss of hydrophytes.

P-T_3-7: Angiosperms Study of Toranmal Area, Maharashtra (India)

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Toranmal Plateau is one of the important plateaus in mid Satpura in Northern Maharashtra. This plateau forms a table land and summit covering about 41 Sq.Km. area at 1155 meter altitude (AMSL). The major area of Toranmal plateau is forest

area which comes under dry deciduous type.In past the forest was comparatively dense and flourished in two storeys. However, present field observations show that the area is affected by deforestation activities. The flora of Toranmal area was surveyed time to time, during the study forty two families, eighty four genera and one hundred five species was recorded a and is given in Annexure I. Higher rainfall and altitudinal influence on temperature preserves moisture for forest growth. The major forest species are teak, bamboo and dwarf spike trees along with grasses, with distribution of plant species following altitudinal influences. The teak and bamboo are found on the slopes and lower valley bottoms of Toranmal plateau, whereas few tall trees and dwarf trees with spikes and grasses are found over the plateau summit. The forest of Toranmal area is tropical dry deciduous with *Tectonagrandis* (Teak) as major tree species. The other trees generally observed are *Anogeissuslatifolia*, *Acaciaferroginea*, *Boswelliaserrata*, *Madhucalongifolia*, *Terminaliacrenulata*, etc.

P-T_3-8: Diversity of coastal vegetation of Jambusar taluka, Bharuch District, Gujarat State, India.

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A group of plants with peculiar features that are dispersed on a relief very much influenced by the coastal biosphere is known as coastal vegetation. Among different types of coastal vegetation mangrove, mangrove associates and salt marsh vegetation are considered in present study as they are generally found in muddy coasts to which the current study area belongs to. The objective of the present investigation was to study the diversity of coastal vegetation of Jambusar taluka of Bharuch district of Gujarat state. The listing of coastal vegetation was accomplished through extensive field surveys. Most of the coastal villages (>80%) were visited and coastal as well as land areas 500 m from the high water line were surveyed. The total 50 number of plants reported from Jambusar taluka. *Avicennia marina* was the single mangrove species observed in this taluka. In addition to this, four mangrove associates, five salt marsh plants and 40 land plants were recorded in the area of 500m from the high water line. The study reveals the presence of two restricted plants, one indigenous plant and two rare plants reported for Gujarat State.

P-T_3-9: Invasive Alien Angiosperm Flora of Telangana, India

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The survey of weeds of natural ecosystems of Telangana state, southern India, spread over 31 districts, has revealed the occupancy of natural habitats by no less than 234 Angiosperm species. These weeds are presented with information about the habit, habitat and nativity. They pertain to all the major groups of Magnoliophyta representing 25 orders, 56 families and 164 genera, and classified as per APG III. The invasives are predominately herbaceous (180; 76.92%) followed by trees (28; 11.96%), climbers (18; 7.69%) and shrubs (8; 3.41%). The greatest number of are terrestrial weeds (212; 90.59%). There are ten problematic true aquatic (4.27%) and 12 semi-aquatic weeds (5.12%). Most of the weeds are from the new world Americas (155; 66.23%) followed by African continent (32; 13.24%), Asia (24; 10.25%) and Europe (6; 2.56%) whereas two of them are from America and West indies. These are further classified according to the growth forms and life-forms and assessed the ecological implications on biodiversity conservation, as these authors have done for Asteraceae.

P-T_3-10: Fruit, Seed and Seedling Morphology of Indigenous Palms

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Tropical Family Arecaceae with 183 genera and about 2400 species stands second to Poaceae in its economic importance. Palms have been supplying the basic necessities of life to human civilizations since times immemorial; providing them with livelihood, sustenance and subtly entering their lives by becoming a part of socio-religious functions and rituals. The family is represented by 22 genera and 105 wild species in India of which 24 species are endemic. In spite of their elegant look, Indian palms have seldom found place in gardens and are neglected by horticulturists. This may be due to non-availability of seeds and lack of information on nursery

techniques for raising their seedlings. In general, the palms are highly variable in habit and exhibit a significant diversity not only in morphology but also in fruit and seed structure, diagnostic to the species and genus. Seed germination and seedling establishment is another aspect of interest for Indian palms for their introduction in gardens. Three main types of seed germination viz. adjacent ligular, remote tubular and remote ligular are reported in palms. The present paper provides an account of types of seed germination in 7 indigenous species belonging to 4 genera of palms. Detailed seed germination and seedling establishment is described in the paper which will be of significance in raising of saplings of these indigenous palms for their introduction in gardens and in turn helpful in their ex-situ conservation. This will lead to a way for introduction of wild Indian palms in gardens.

P-T_3-11: An assessment on breaking the seed dormancy in *Daucus carota*

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Seeds of *Daucus carota* fail to germinate because of factors associated with the embryo which comes under endogenous dormancy. Endogenous dormancy includes morphological and physiological types. However seed dormancy is the common problem of the umbelliferous family. It has been found that *D. carota* seeds have embryos that are torpedo shaped and up to one-half of the seed cavity. In this experiment, seeds with undeveloped embryos have been targeted. Using plant growth regulators in combination with chilling and /or warm temperatures effect on breakage of dormancy has been studied.

P-T_3-12: Primary observations on Thorny vegetation &Rare endanger species of Jambudia vidi India

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Jambudiavidi is located between 22°29'69" N latitudes and 70°79' 84" W longitudes wankaner taluka of Rajkot district in saurashtra peninsula. The north part of Rajkot district adjoin to surendranagar. With wide variety of physical features and climatic

conditions, India posseses the richest and perhaps most diversified flora of all other countries of a similar size on the surface of the earth, it is estimated that out of 250,000 – 300,000 total plant species of the world, India harbors about 45000 plant species. The vast tract of the wasteland "vidi"(grazing land) The area was acquired by couerment in 1988. The present study during 2016 to 2018. The present investigation indicates the most dominaed thorny vegetation enumeration of these species with local name & Botanical name and scientific name .we have taken photograph and prepared digital herbarium of each species.

P-T_3-13: Wild Ornamental Plants of Nallamalais, Andhra Pradesh

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Ornamental plants include all those grown for decorative purpose-annuals, perennials, shrubs, pot plants for foliage and floral display, dried materials, cut greenery from trees, shrubs, herbs, grasses, ferns, cultivated cut flowers (live or dried), wild gathered live or dried flowers, geophytes (bulbs, corms, rhizomes, tubers, rootstocks), trees in parks and gardens and roadside trees. Ornamental plants are native, exotic or naturalized. Planting native species in aesthetically-managed landscapes has ecological benefits. The absence of good inventories becomes an obstacle to planning and prioritising of collecting and other conservation activities related to wild ornamentals. India having vast plant resources, lack comprehensive data on indigenous ornamental plant genetic resources and the need for surveys, inventories, taxonomic studies, and other analyses of existing diversity. Andhra Pradesh is no exception in this regard. With this background we inventorised ornamental plants encountered in Nallamalais of Andhra Pradesh.

Nallamalais, one of the Centres of Plant Diversity (CPD) (Davis et al., 1995), represent a group of moderately steep hills located in the Central Eastern Ghats between latitudes 15□20' – 16 - 30' N and longitudes 78□30' - 80□10' E in Andhra Pradesh and Telangana States. Nallamalais encompass mainly the districts of Kurnool, Prakasam, Kadapa and small patches in Guntur in the state of Andhra Pradesh. Gundlabrahmeswaram is the nucleus of the Nallamalais appearing as plateau.

We explored Nallamalais for a period of two years during 2016-18 and recorded the presence 237 wild ornamental species. Of the 237 species, 28 belong to Fabaceae followed by 26 grass species and 12 orchid species. Significant ornamentals which can be propagated in nurseries for planting includes Barleria longiflora, Barleria montana, Thunbergia fragrans, Gmelina asiatica, Ipomoea hederifolia, Jasminum cuspidatum, Indigofera cassioides. In the conference, we would like to display the diversity of ornamental plants of Nallamalais.

Theme-4: Ethnobotany, Medico-Botany, Biofuel and Bioprospecting

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P-T_4 -1:Proximate analysis and mineral composition of some selected wild edible fruits of family Rutaceae

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The present investigation deals with the study of proximate and mineral composition of some selected fruits of plant species belongs to family Rutaceae viz. *Murraya paniculata* (L.) Jack and *Toddalia asiatica* (L.) Lam. Most of the people from adjoining areas of Kolhapur district utilized these fruits in different food recipes and as medicine for curing various kinds of disease. So, present investigation has been carried out to evaluate the nutritional potential of selected fruits.In present study higher amount of crude fat were reported in unripened fruit of *Murraya paniculata*(17.5±0.31). Higher amount of crude fiber (18.0±0.1) and crude protein (19.31±0.21) were reported in unripened and ripened fruit of*Toddalia Asiatica*respectively. The present investigation also focused on mineral composition and it showed sufficient amount of macro as well as micronutrients. On the basis of above investigations the fruits can be recommended as a treasure of important nutritionally active biomolucules and it is play a very promising role in today's herbal medicine.

P-T_4 -2:Dye yielding plants of Barwani district, Madhya Pradesh

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Natural dyes are colours obtained from plants, invertebrates or minerals. Vegetable dyes from angiosperm plant sources comprise major part of natural dyes. Further, other biological sources such as fungi and lichens also contribute in the production of natural dyes. Basically natural dyes are obtained from animal or plant material without any chemical treatment. Natural dyes have several advantages over the synthetic dyes like their biodegradable and non-toxic nature, environment friendly and aesthetically appealing properties. Easy extraction of colour by boiling the plants, berries, leaves, bark or flower heads in water increases the acceptability of natural dyes. But due to the discovery of synthetic dyes in nineteenth century a marked decline in the use of natural dyes was experienced. Now-a-days extraction and use of natural dyes is confined as traditional knowledge (TK) among the rural people of few villages only. Barwani district in Madhya Pradesh has such few areas where this TK is still available among the villagers. District is situated on the south-west part of Madhya Pradesh and lies between $21^{O}37^{/}$N- $74^{O}27^{/}$E and $22^{O}22^{/}$N-$75^{O}30^{/}$E. In the

present communication TK available with the villagers in Barwani district is documented using semi-structured questionnaire. During field survey in the study area, 11 plant species are recorded which are used as a source of natural dyes. Among these species 02 species are exploited for their bark, 04 species for flowers, 01 species for fruits, 03 species for leaves and 01 species for bark as well as flowers.

P-T_4 -3:Ethnic knowledge based recognition of plants having research potential

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The state of Gujarat is proud of having a comprehensive database (GEER, 2005). One could deduce that the plants already mentioned in Vridhtrayi (Charak, Sushrut & Vagbhatta) are about 650. Whereas the aforesaid document on Gujarat plants itself includes more than 1375 species. This is the great bonanza of knowledge available to the subsequent worker on medicinal plants.

Being a student of Botany, the reserachers of sister branches like Ayurveda, Pharmacognosy, Homoeopathy do keep questioning about the names of plants on which the research could be carried out. This has prompted to carryout a literature survey to identify the group of species that could be researched. The article includes such groups as plants of controversial identity, plants known in Ayurveda by their group names, potential species that could be brought into the main stream Ayurvedic medicine. Plants facing threat due to over exploitation or due to destructive methods of collection are also identified.

Author also being associated with the National Innovation Foundation, where a devoted herbarium of non codified plants is created with the assistance of ICMR, New Delhi. Modern herbal researchers are also now trying sincerely to bring Anukta Dravyas to the mainstream herbal medicine as done by Shri Bapalal Vaidya Botanical Research Centre, Surat that resulted in herbal medicine for malaria and skin disorders from *Calotropis* R.Br.

P-T_4 -4:Quantitative analysis of Sugar from flower Nectaries

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The presence of nectar in plant is an important component in the process of pollination. Varied kinds of flowers show presence of different amount of nectars and sugars. In present study two sugars that is glucose and fructose were considered, and different ornamental flowers were collected from the campus of Navrachana

University, Vadodara. The preliminary qualitative analysis revealed the presence of glucose and fructose in some of the samples. For quantitative assessments, spectrophotometric techniques were used to determine the relative amounts of sugar components of a nectar sample. For glucose and fructose estimation, anthrone and tryptophan methods were followed respectively. This process will give accurate amount of sugar present in our sample.

P-T_4 -5:Diversity of ethno-medicinal plants in and around the Girnar hills in Junagadh, Gujarat

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Girnar and its surrounding area is one of the pristine vegetation representing significant biodiversity including plants and animal which is spread in more than 180 sq. km area. During the present investigation, a floristic exploration conducted to know the diversity of plant species having the medicinal importance. In this context, a total of 357 species of higher plants reported which area belongs to 287 genera and 87 families. Poaceae, Fabaceae, Asteraceae, Euphorbiaceae and Acanthaceae are the most dominant families and each are representing more than 10 species. Whole plant (herbaceous), Root, Leaves, Fruits and seed are the most common plant parts used in curing various diseases. Out of the reported 357 species, 138 are used in gastrointestinal problems, 97 are in Skin diseases and 82 are in gynaecological and sexual problems. Hence, the Girnar hill and its surrounding area supporting medicinally significant plant species. However, many of them are facing the threats to their existence. It is recommended detailed quantitative and qualitative assessment of floral diversity needs to be undertaken and identify the species of conservation significance. The outcome will help to draw the conservation and management strategies which would be helpful to preserve the vital traditional knowledge.

P-T_4 -6:Protective measure of Medicinal plants expose to heavy metals

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Presence of heavy metals residues in environment also reach and are assimilated into medicinal plants. Cu is an essential element but excess amount is toxic while Cd and Hg are phytotoxic in nature. Isabgol and Garden cress are important medicinal plants

containing mucilage. The various growth parameters from control and treated plants were studied from 15d and 75d after sowing, reproductive growth was also studied, mucilage and heavy metal were estimated from seeds. Isabgol was sensitive to single, binary and ternary interactions. Binary interaction of each metal gave additive effect. Cu induced slightly alleviated effect on growth. The adverse effects of heavy metal were noted even in 15days old plants in Garden cress. Decrease in leaf number may be the reason of overall reduction in growth in Isabgol. The flowering and fruiting was also affected. Hg and Cd did not allow Isabgol to flower.In Garden cress flowering was occurred in all heavy metal treated plants. It may be considered as more tolerant to heavy metal. In Isabgol, binary mixtures enhanced the uptake of heavy metals. Addition of Cu to Hg+Cd significantly lowered uptake of Hg. Isabgol in comparison to Garden cress was more sensitive and it was due to its ability to accumulate more amount of heavy metal in the plants. However, the accumulation of heavy metals in medicinal plants must investigate before reach to consumer.

P-T_4 -7:Strategic approach for documentation and dissemination of Traditional Knowledge related to medicinal and food plants

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Traditional Knowledge (TK) is the basis for the food, health and economic security of millions of people and has been developed and transpired through generations in the form of healing arts, agricultural practices, cultural values, local languages, customs and customary practices for the well being of the communities. TK also refers to experiences of longstanding traditions and practices of certain regional, indigenous or local communities that encompass the wisdom, knowledge, teaching and experience. TK is rapidly vanishing due to changing lifestyle of the people and unsustainable developmental activities. To document this intangible asset, Ethnomedicine&Ethnopharmacology Division of Jawaharlal Nehru Tropical Botanic Garden and Research Institute (JNTBGRI) has embarked on a noble journey to document, sustainably utilize and disseminate TK since 1992. The efforts taken by JNTBGRI to disseminate the importance of this vast knowledge system and for the development of new drugs, molecules, food products, etc., through human resources development, preparation of pharmacopoeial monographs for enriching Ayurvedic Pharmacopoeia, preclinical studies, drug development, intellectual property rights, benefit sharing and publication of Journal of Traditional and Folk Practices are discussed in the paper.

P-T_4 -8:Induction of defense mechanism in date palm as a response to elicitation with fungal cultural filtrates.

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The date palm is aperennial, heterozygous and monocotyledonous plant with much horticultural importance. Kutch and Saurashtra region of Gujarat are the highest date producing regionsin India. A survey of date palm orchards was conducted in Saurashtra and Kutch and it was observed that the plants were affected by various plant pathogens, whichresultedin reduced life span of plant, loss of fruit yield and reduced fruit quality.Thus, the samples from infected plants were collected for the isolation and identification of pathogens. *Rhizophusoryzae*, *Aspergillusniger*and *A. flavus*were isolated from infected leaf samples. The fungal cultural filtrates(FCF) were prepared from *R. oryzae*and*A. niger*for the present study. The foliar spray treatment with ROFCF and ANFCF was given to date palm plants in field to study the effect of fungal cultural filtrates to induce the defense mechanism in treated plants. The results of the investigation revealed the increase in the activity of various defense related enzymes such as phenylalanine ammonia lyase (PAL), Polyphenol oxidase(PPO), peroxidase (POX) and β-1, 3-glucanasein FCF treated plants as compared to control. The results also indicated the increase in total proteins, total phenols and total carbohydrates concentration in comparison with untreated plants used as control. Thus the fungal cultural filtrate may act as elicitors that can activate the inbuilt defense mechanism in plants which help to build immunity against pathogenic infection and lead to improved overall growth, development and yield of the plants.

P-T_4 -9:Wild Vegetables as food source in Maharashtra

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Tribal people are using wild vegetables as traditional food found in forest. These vegetables are available as per season, the knowledge about use of these vegetable is seen even new generation. These are valuable as they have high nutritive value and medicinal properties. The tribal communities include wild edibles as daily food intake and sales from the surplus add to their income. These edible herbs and plant parts are rich in source of protein, iron, and calories. They are used in diet to prevent the nutritional deficiency and degenerative diseases. Wild vegetables refer to species which are not cultivated at large scale commercially. They are grown on waste land

by tribal peoples.Ethanobotanical study is carried out by survey of local market and household food survey. There are 32lakh 83thousand species all over the world. India has 1530 species out of which 145 are tubers, 521 are leafy vegetables,102 floral vegetables,647 fruit vegetables &118 seed and nuts.

P-T_4 -10:Ethano-botanical literature on anti-cancerous plants: A review

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The present abstract gives an overview of the definition, history in brief and general views on Ethnobotany. Indian folk-medicine and Ethnobotany has identified around 2532 plants with medicinal uses. India has about 45,000 species of plants; medicinal properties have been assigned to several thousand. The value of ethnomedicine has been realized; work is being done on medicinal plants, household remedies and plants sold by street drug vendors. The present work gives an overview of few plants used as medicinal plants and few important plants with anti-cancer properties. The vast topic study is easy to study if studied in different regions of India as some regions have more biodiversity of medicinal plants.
This vast knowledge of medicinal plants is very useful to us in our day to day life but it's a reminder to all the scientists and researchers in the world who work in this field that Mother Nature has provided many means and tools to fight against terrible and lethal diseases. And we all invest more in the medical researches and studies of these natural remedies rather than using chemicals for the curing the symptoms of the diseases.

P-T_4 -11:Nutrients, phenolics and antioxidant activity of *Riveahypocratiformis* (Desr.)Choisy: a wild vegetable used by tribal communities of Northern Western Ghats

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Rivea hypocratiformis, is an important plant used as a source of leafy vegetable by the communities in northern Western Ghats. This study evaluated the nutrients, phenolics and antioxidant potential of the leaves.The phenolic contents and antioxidant activities of four extracts of the leaves were measured in different in vitro

methods and the individual phenolic compounds were determined by HPLC. The proximate content viz., carbohydrates, proteins, lipids, crude fibre, moisture and ash contents were 14.09, 18.73, 3.35, 7.18, 12.7 and 3.49% of dry weight respectively. Among the mineral elements, nitrogen content was the highest, followed by calcium, phosphorous, potassium, magnesium, iron and zink, while in the heavy metals were below the permissible level.The vitamin A and B were found to be 6.22 and 185.71µg/g. In addition to that, the anti-nutritional facors such as phytic acid, saponins and tannins were observed in lower level.The leaves also possess high phenolic and flavonoid contents with potent antioxidant activity. When the leaves subjected to high-performance liquid chromatogram analysis, four polyphenols namely caffeic acid, cinnamic acid, salicylic acid, and quercetin were detected.Thus, this species should be considered as a good alternative to increase the diversity of vegetables consumed also the safety and toxicity analysis of this leafy vegetables need to be extensively studied.

P-T_4 -12:Study on worshipping plants from different religious places of Kheralu city, North Gujarat, India

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Gujarat is situated in central western part of India. Is located in Northern side of the Gujarat at the Latitude 23.8853^0 N , and longitude 72.6190^0 E .Present research work is related to Plants And Plants Parts In Different Religious Places of Kheralu city.

In Kheralu city we are taking some of religious places like Vrundavan Mahadev Temple, Shri Maranda Mataji temple and Panchmukhi Hanumanji Temple. Present paper deals with 24 plant species under 22 genera and 18 families.The collected worshipping plant specimens were identified with help of Flora of Gujarat State (Shah, 1978) and other published literatures. Classification of the all plants created with the help of Bentham & Hooker system of classification. Some of the plants are also used in "Yagna''. "Yagna'' literally means "Sacrifice, devotion, worship, offering", and refers in Hinduism to any ritual done in front of a sacred fire, often with mantras. Offering flower to god is known as "Pushpanjali''. In word "puja'' (PU) means (pushpam) or (flowers) and (JA) means (japa) while chatting the name of God. Offering flowers to god is also sign of our devotion to god and one should do so with heart.

P-T_4 -13:Phytochemical screening of some plants of Family Lamiaceae

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Family Lamiaceae (Mint Family) is known for medicinal and aromatic plants, which are reservoirs of certain curative elements to treat cold, sore throat, mums and other ailments, The phytochemical analysis was conducted to test the presence of alkaloids, flavonoids, phenols, saponins, terpernoids, proteins, glycosides, tannins, and quinines in *Solenustemonscutellaroides, Clerodendronpaniculatum, Leucasaspera, Menthaspicata, Ocimum sanctum* and *Plectranthusamboinicus* of family Lamiaceae, which will provide the use of secondary metabolites in traditional medicine. The locally available plants were collected, dried, powdered and used for preparation of crude extract. The qualitative test for different phytochemicals was undertaken using two extracts – distilled water (aqueous extract) and ethanol (alcoholic extract). The tests were performed using standard procedures. The phytochemical tests reveal the presence of alkaloids in the leaves of both type of extracts while aqueous extract showed the presence of alkaloids in the stem, leaves and roots of all the plants except the roots of *Leucasaspera*. The aqueous extract was also positive for flavonoids, proteins and phenols, while flavonoids, proteins saponins and quinines were positive in ethanol extract. This work will provide an insight in the use of secondary metabolites, which can promote human health and can be a source for discovering new drugs

P-T_4 -14:Qualitative Analysis of sugars from the nectar of selected flowering plants

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Nectar is a sweet aqueous substance secreted by flowering plants. It mediates the interactions of plants with pollinators and defenders. Nectar can be secreted on virtually all plant organs except roots. The present study was undertaken to understand the chemical nature of sugars present in the nectar. Hence, nectar was collected from different species of flowers collected from Bhayli region of Vadodara using a capillary tube and dissolved in 75 % methanol. They were loaded on silica gel plates and run using Chloroform:AceticAcid:Water (3:3.5:0.5) as the solvent system. They were developed using aniline diphenylamine reagent. Most of the samples showed the presence of sucrose, glucose and fructose which were used as standard sugars.

P-T_4-15:Observation on species richness of woody plants with their taxonomic Enumeration and Ethnomedicinal aspects from Jambudiavidi at Saurashtra region, Gujarat, India

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The present study is made of Jambudiavidi area at Saurashtra region. Angiosperm diversity of plant forms like trees and shrubs constitute the important component of plant taxonomy. Trees and shrubs have always been associated with wisdom and immorality intheworld and also play a role in many myths and ethno medicinal values. The present area is selected for the studies because it has given attention for its remarkable vegetation and Angiosperm diversity. Most of the non - reserve 'Vidi' and degraded hills and wasteland of Saurashtra area are categorised as dry grassland which are contribute to the habitat diversity of area . The present study compacts with total 69 species of trees belonging to 33 families along with their scientific names, families and forms. The most dominant families were Mimosaceae (12 species), Moraceae (06 species), Caselpinaceae (04 species). As well as 43 shrub species belonging to 24 families. The most dominant shrub families are Fabaceae (05 species), Euphorbiaceae(04 species), Acanthaceae (03 species). All the reported species are identified by using flora of Gujarat and other valuable literature.

P-T_4 -16:Tree Vandalism: A Survey of selected parks and streets in Vadodara city

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Street trees are important foundations of urban sustainability due to the ecosystem services that they provide society and the environment. However, street trees are vulnerable to vandalism and damage, especially when small, which constraints the benefits they provide and also increases the costs of planting and re-planting programs. Despite being a common phenomenon, there is limited knowledge regarding the extent of vandalism and the reasons for it. The results of a survey of trees and palms of different parks, and main streets of the study are presented. According to residents, boredom, misbehaviour, lack of appreciation of trees and collection for wood were the main factors for tree vandalism by people along with damage by livestock. Ward councillors recognized the presence of vandalism, but indicated that it was not a priority topic in their ward meetings. Suggestions by residents to prevent vandalism included: planting in sensible areas, re-designing the

protective structures, re-locating livestock and create community participation and ownership in all aspects of street tree planting.

P-T_4 -17:Early Biochemical changes in *Jatropha curcas* seeds during natural, accelerated and saturated salt accelerated aging

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Among the putative plants, *Jatropha curcas* emerges out tobe the best source of feedstock for biodiesel due to high seed oil content. Oil rich seeds like *Jatropha curcas* are prone to faster seed deterioration when subjected to improper storage conditions like high temperatureand moisture. The purpose of this study is to investigate early biochemical changes occurring in seeds of *Jatropha curcas* during storage. For this, natural, accelerated and saturated salt accelerated aging models have been used. For a tropical country like India, such study is important to optimise the oil yield with good quality and quantity.In our study we see that level of H2O2 gets significantly increased from the third month of natural aging. The changes seen with 3 months of natural aging could be mimicked with just 12 hours of accelerated and saturated salt accelerated aging treatments. Other changes that were monitored are auto oxidation of lipids, ascorbic acid content and size and structure of the oil bodies. Reduction in ascorbic acid content was observed at all time points of study in all three categories. Distorted size and structure of the oil bodies were observed during 12 months of natural agingand in 5 days of accelerated and saturated salt accelerated aging. Such knowledge of seed behaviour during storage is important to maximize oil yield.

P-T_4 -18:Use of Fenugreek seeds in preparation of Selenium Nanoparticles to treat Hypothyroidism

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Humans have about two dozen selenoproteins. These proteins contain the 21st amino acid, selenocysteine (Sec), incorporated co-translationally into the peptide backbone in a series of reactions dependent on at least 6 unique (Se-specific) gene products. Glutathione peroxidase(Gpx) was the first identified selenoprotein. The thyroid is the organ with the highest selenium content per gram of tissue in body. Most of the

known selenoproteins are expressed in the thyroid. Treatment of hypothyroidism using thyroxine has many side effects. Se supplementation can be beneficial in treatment of hypothyroidism. However, giving Se as such is riddled with side effects and problems of bio-availability. Selenium nano-particles have shown improvedbio-availability and less side effects. We report here the synthesis of Se nano-particles using Fenugreek seeds. The nano-particles have been characterised by SEM and DLS.

P-T_4 -19:Micropropagation studies on Salvia splendens (Lamiaceae), a medicinally important plant

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Salvia splendens is one of the most important folk medicinal plants because of its excellent performance in treating coronary heart disease. Phenolic acids mainly including caffeic acid, rosmarinic acid and salvianolic acid A & B are present in this plant. The whole plant is used to cure many diseases due to its antiviral, antibacterial, anti-inflammatory, antioxidant, anticancer, anti-diabetics and anti-Alzheimer activities. The present study deals with the micropropagation of S. splendens from shoot tip and nodalexplants. Different concentrations of auxins and cytokinins were used for micropropagation.The shoot tip explant showed multiple shoot formation and elongation on medium containing 2.0mg/l BAP with 97.2 ± 0.43% of response and 14.7 ± 0.40 mean number of shoots/shoot tip explant. The nodal explant showed best multiple shoot formation and elongation on medium containing 2.0mg/l BAP with 99.6 ± 0.13% of response and 18.3 ± 0.44mean number of shoots/nodal explant. Efficient root induction was achieved by IAA at 2.0mg/L with 96% of response and 26.9 ±0.90mean number of roots/shoot. The rooted plantlets were then transferred to plant growth chamber for hardening.

P-T_4 -20:Key role of the Taxonomist in a Nature Conservation Awareness Programme: A case study

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Identification of the basic components of an Ecosystem is essential for the better understanding of its status and the health of prevailing environment. The development due to Urbanization has great deal with degraded biodiversity and its well-being. In this paper we will discuss how a Taxonomist can relate common

people with their surroundings and popularize the basic techniques of plant identification based on morphological characters. How the native species are important for local ecological cycles, their cultural utilization and conservation techniques those can be woven with mythological stories, historical references and their present status in particular locality. We try to enhance capabilities of people to identify plants and learn their importance. This has resulted in a group which pass on information to other interested individuals and groups. We also plan out basic study modules for school students, botany students and students from other disciplines, so that plant identification becomes easy and interesting. The efforts just not has resulted in more people taking interest in plant identification but they also have realized the importance of classical systematic studies on one hand and the conservation of the plant species on the other.

P-T_4 -21:Medicinal Plant Species of Kumbhalgarh Wildlife Sanctuary of Rajasthan

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A number of reports are available on medicinal plants of different regions of Aravali mountain range of Rajasthan. However there are some localities of rich floristic composition with species either unknown or less investigated from the medicine point of view. Therefore, the surveys made during different times and seasons of the year 2017-18, mainly hilly tract near by Kumbhalgarh and Jarga Parwat were selected for the investigation. Most valuable and precious plant species were identified and explored having great potential of medicinal value. The information about the medicinal uses of these plants was gathered from a primitive tribe i.e. Bhills who has in depth knowledge of many other plant species. Few species out of the investigated plants are under cultivation in department of botany, SPC Government College, Ajmer. These species having miracle medicinal properties were brought to the small home garden maintained by the author for further studies, particularly for analysis of active principles.

P-T_4 -22:Plant diversity in the home-gardens of Vadodara city

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A study was conducted in 21 selected home gardens of Vadodara, Gujarat, India to document their floristic diversity and composition with regard to life forms and uses.

As many as 185 species and intraspecific taxa of flowering plants belonging to 75 families were recorded. Asparagaceae (11 taxa), Moraceace (11), Leguminosae (10), Apocynaceae (8) and Arecaceae (8) are the predominant families. Herbs are the dominant life forms, followed by shrubs, trees and climbers. Majority of the plant species are grown mainly for ornamental and aesthetic purposes while some of them are used as fruits and vegetables or medicinal purposes.

P-T_4 -23:Callus induction from in-vitro seedlings of *Ailanthus excelsa* Roxb.

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Ailanthus excelsa Roxb.- conceived as "Tree of Heaven", is popular for its medicinal, pharmacological and pharmaceutical properties. It belongs to "Simaroubaceae" family. It is a soft wood tree found in tropical areas. Commercially, it is used for silk worm cultivation and as fodder since long. It becomes difficult to cope up with the demand of this deciduous tree due to poor seed viability, less competitiveness and lack of effective cloning techniques. Micropropagation offers the effective solution for this problem by in vitro seed germination, which provides sterile plantlets. In the present study, seeds of Ailanthus excelsa were germinated in Murashige and Skoog Media (MS media) with growth regulators. Seeds were germinated in media containing low concentration of Giberellic acid under dark condition over 15 days. The plantlets were allowed to grow in sterile condition at 25^{o}C, under photoperiod (16hrs light and 8 hrs dark) to achieve considerable length. One month later, every part of plantlets, were excised in 1-2 cm length and transferred to media supplemented with different concentration of naphthaleacetic acid (NAA) to achieve callus. Transparent callus was developed over 15 days under dark condition. Callus was maintained in media supplemented with moderate concentration of NAA in dark. Transparent callus converted to friable over the period of time. After three successive subcultures, friable callus was transferred to basal medium for organogenesis. Shoots and roots were induced from the friable callus. It was concluded that, auxin (NAA) induced callus formation in explants obtained from in-vitro seedlings of *Ailanthus excelsa* Roxb.

P-T_4 -24:'Live fence' a traditional practice plays an important role in agricultural ecosystem

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The present paper focuses on the various traditional practices followed by the locals in the villages nearby the Vadodara urban area with special emphasis on agriculture hedge plants categorised live fence. The plants present in the live fence were source of important edible plants with the potential of being a secondary source of income generation. These hedge plants also played a vital role in natural control of pest as these provide the habitat for various birds, which are the natural predators. A close network of simple food chain and web existed in the traditional agricultural hedges, but with the modernization of agriculture and barbed wire fencing has not lead to loss of biodiversity (few species have gone locally extinct), but replaced the food web that existed. The paper tries to throw light on important plant species that existed in the live fence and their ecological and economical value. Most of the farmers have expressed their intention for reintroduction of the hedge plants in their live fence as a step towards biodiversity conservation.

Theme 5: Phytogeography, Endemism and Threatened Plant diversity and Climate change

P-T_5 -1: Taxonomic assessment of Phytoliths of Genus *Dichanthium* Willemet.from Maharashtra, India

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The Poaceae is the fourth largest family among angiospermsand the systematic classification of grasses is difficult on the basis of variation and similarities of characters.Thephytoliths investigation of leaf surface can be used for delimitation of taxaassize,shape, orientation and frequency of assemblage are different among the grass species.In the present workphytoliths of some species of *Dichanthium*were studied. The phytoliths were isolated by the method of chemical oxidation, the observed phytolithsmorphotypes are classified as per the standards of ICPN (International Code for Phytolith Nomenclature).

P-T_5 -2: Biodiversity prospecting for identifying metal Hyperaccumulator

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The lack of adequate clean water to meet the requirement of drinking water and sanitation for human beings is indeed coercion on human health and productivity. Therefore for the maintenance of a clean environment and healthy ecosystems knowledge of existing biodiversity is must as it is the key indicator of the health of an ecosystem. A large variety of plant and animal species will cope better with threats than a limited number of them in large populations. Even if certain species are affected by pollution, climate change or human activities, the ecosystem as a whole may adapt and survive. The importance of biodiversity is increasingly considered for the ecosystems contaminated with metal pollution. This subject is emerging as a cutting edge area of research gaining commercial significance in the contemporary field of environmental biotechnology. A good knowledge on taxonomy would not only help to identify metal hyper accumulator plant species but also would suggest conservation strategies of these plant species. The purpose of this review is to bring together such diverse information in order to identify the potentialities of higher plants as accumulators of metallic elements. Several microbes, including mycorrhizal

and non-mycorrhizal fungi, agricultural and vegetable crops, ornamentals, and wild metal hyper accumulating plants are being tested both in lab and field conditions for contaminating the metalliferous substrates in the environment are reported by several researchers. The families dominating these members identified as metal hyperaccumulators are Asteraceae, Brassicaceae, Caryophyllaceae, Crassulaceae, Poaceae, Ceratophyllaceae, Lentibulariaceae and Pontederiaceae.

P-T_5 -3: Burl formation in *Mangifera indica* L.

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Mango (*Mangiferaindica* L.) is one of the most economically important fruit crop of India. It is also grown in tropical and subtropical region of all over the world due its delicious fruits. It is affected by numerous types of disease and disorders that decreases the quantity of yield as well as quality of fruit. One of such lesser know disease “Mango burl” which is not only reported from India but also documented from various parts of the world.Burl is warty or corky, uncontrolled outgrowth, generally occurs on main trunk and primary branches which express different morphological characteristic. The Present study was conducted to investigate its incidence in various germplasm from Gujarat state. Our study revealed that it reduces fruit quality as well as yield and trees become more susceptible to other pathogens. Nearly 20 mango germplasm were found susceptible from which eight of them had 100 % incidence. During the study, around 10 % of overall incidence was observed in Gujarat. Maximum burl size and fruit yield loss were observed in Langra variety as compared to other germplasms. Region wise, highest burl incidence and yield loss was observed in Pariya than other parts of the state. The burl incidence, burl size and fruit yield loss is directly related with the age which increases with an increase in the age of the tree. Further studies on etiology, causal organism (if any?) and extent of crop damage is under progress.

P-T_5 -4: In-situ conservation of indigenous flora at the Ninai Mata sacred grove in Gujarat

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Sacred groves are the living museums of forests and its resources to carry out relevant research. Some of the species so preserved are of medicinal value, while others could acquire such importance in future. Believers think that breaking even dead twig in sacred groves may result in serious illness or in violent death; such distinct taboos have led to the conservation in these sacred groves of forest in its virgin condition, and a significant role in promoting sustainable utilization and conservation of flora and fauna of the region.The present survey is of Ninaimata sacred grove which is popularly known as the Ninai waterfall in Dediapadataluka of Narmada district. Owing to the protection offered on religious grounds this sacred grove harbors many plant species of rare occurrence like *Adelocaryumcoelestinum*,*Bauhiniavahlii*, *Begoniapicta*, *Canscoraperfoliata*, *Hemidesmusindicus* var. *pubescens*, *Impatiensminor*, *Lagerstroemiamicrocarpa*, *Microchiritahermosa*, *Tricholepissp*.

P-T_5 -5: Angiosperms are thriving dwellers for epiphytic vascular cryptogams

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Vascular cryptogams are one of the integral components of world flora as they occupy a prominent position on the earth's vegetation at approximately 360 million years ago marking the beginning of Mesozoic era. However, present day flora has been largely replaced by the angiospermic plants. Cryptogams are the earliest land dwellers, holding a simple organization in body and are unique in being characterized by the cryptogrammic mode of reproduction. Generally, vascular cryptogams are known as pteridophytes or fern and fern allies or seedless vascular plants, characterized by self-regulating heteromorphic alternation of generation. Recently, they are known by the name lycophytes and ferns. About 10,000 species belonging to 305 genera of pteridophytes occur in the wild flora of the World of which around ca.

191 genera and 1080 species are distributed in different biogeographical regions of India mainly diversified in Himalayas, Western Ghats and Eastern Ghats. Amongst these 10-15 % species are epiphytes, growing on different angiosperm tree viz., *Albizia lebbeck* (L.), Benth., *Anacardium* occidentale L., *Baccaurea courtallensis*Muell.-Arg. *Calophyllum polyanthum* Wall. ex Choisy, *Dipterocarpus indicu* Bedd., *Ficus religiose* L., *F. racemosa* L., *F. benghalensis* L., *Mangifera indica* L., *Myristica dactyloides* Gaertner, *Semecarpus anacardiumi* L.f., *Syzygium cumini* (L.) Skeels, *Syzygium densiflorum*, *Terminalia arjuna* (Roxb. ex DC.) Wight &Arn., and *T. chebula* Retz. Therefore, the aim of the present study is documentation of angiosperms that provides shelter for epiphytic vascular cryptogams from Northern Western Ghats of India.

P-T_5 -6: Endemic plants of Anjaneri Hill, Nashik District, Maharashtra

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Northern Western Ghats encompasses higher plateau or tablelands, harbour great diversity of plants. The Anjaneri hill is an important high altitude basaltic rock outcrop, exhibited different habitat due to distinct geographical location, climatic condition and edaphic nature. In the present studies 114 endemic species to India / Western Ghats (33) were reported. Large number of endemics are due to varied microhabitats. The environmental uniqueness, high diversity, high anthropogenic activities and rapid destruction of these ecosystems make Anjaneri outcrop “hotspot”.

P-T_5 -7: The genus *Arisaema* Mart. (Araceae) in India: Diversity,Phytogeography and Endemism

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The genus *Arisaema*(Araceae), with about 208 taxa, is widely distributed from north-eastern Africa through tropical, sub-tropical and temperate Asia to North America. The Sino-Himalayan region is considered as the major centre of distribution and possibly the centre of origin of this genus. China harbors the maximum number of species (82 species & 1 subspecies) followed by Japan (51 species & 9 subspecies) and India (51 species & 6 varieties). It is the largest genus of Araceae in India, distributed mostly in Western Ghats, Eastern Himalayas and Western Himalayas. The present paper deals with the diversity, phytogeography and endemism of this genus in India.

P-T_5 -8: *Ex-situ* Conservation of Endemic Endangered plant *Pavonia arabica* var. *massuriensis* Bhandari in Indian Desert

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The genus *Pavonia* was established by Canavilles (1786) based on the type species *P. paniculata* Cav. The genus *Pavonia* consists*c.* 250 species and 2 verities distributed in the tropical and subtropical parts of the world (Fryxell, 1999). In India 7 species are found (Sultanul Abedin, 1979; Sharma & Sanjappa, 1993) out of them 4 species *viz. Pavonia arabica* Hochst. ex Steud., *P. odorata* Willd., *P. procumbens* (Walk. & Arn.) Walp.and*P. zeylanica* Cav. occur in Indian desert while *P. arabica* is followed by3 varieties viz.: *arabica, glutinosa* and *massuriensis* (Bhandari, 1978; Shetty & Singh, 1987).

Pavonia arabica var. massuriensis Bhandari, a endemic, endangered, threatened plant of Indian desert has been rediscovered during the survey and exploration of Machiya Biological Park for quadrate study in 2017 after a lapse of nearly 58 years. Observations were recorded on its fruit, seeds, seed germination and seedling growth during its *ex-situ* conservation and as well as natural habitat which have been dealt in the present paper.